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EDITORIAL NOTES.

No Sign from Mr. Runciman.

FOUR weeks have passed since a representative body of large coal users in the public service—gas and electricity suppliers—had an interview with Mr. Runciman at the Board of Trade on the subjects of coal supplies and transport, and a week later another highly important deputation from the Manchester district had an interview with the Parliamentary Secretary to the Board of Trade (Mr. Robertson) upon the same subject. The, to these two public industries, serious position from several points of view of the coal supply and transport question was made abundantly clear to the President of the Board through these two deputations; and he promised that the representations should have the careful consideration of the Government. In view of the pressing necessities of the two industries, it would be of real interest, and it is hoped would alleviate anxiety, to now hear something as to the result of the "careful consideration" bestowed on the matter by the Government. Up to now, neither by way of word nor act has anything been seen to assure the industries concerned that the Government have deliberated over the matter, and have set in motion plans which, it is believed, will be promptly and valuably effectual. Ample coal supply and continuity of delivery to the gas industry, as well as to the electrical, with transport at reasonable rates, are as important (quite apart from the general community) to the industries of the country, including those working on war material, as is the provision of dyes to other industries. There seems to be a total lack of appreciation of this in the Government Departments; and this is peculiar, seeing that the problem of effecting improvement in the coal supply and in its transmission does not present so much difficulty as the national dye scheme, unless, of course, the coalowners and the shipowners are in resolute opposition to anything being done by the Government to prevent them commanding, by any means they think fit, high prices for coal and high rates of freightage. If this is the case, the duty of the Government is not one of supineness and inaction in the interests of coalowners and shipowners, but the reverse in the interests of the rest of the country. Some gas-works in the North—gas-works nearer the coal-fields than the works down South—are even now in a perilous position in regard to supply. The serious thing that the situation is for the London and Suburban Gas Companies is evidenced by the prices that consumers—the poor as well as the middle-class and the rich—are being called upon to pay. All over the country, eyes are turned Westminsterwards; but there is no sign from the Government, to whom (as the appointed guardians of the country's internal as well as external interests) the industries turned for measures of relief.

A Crucial Test and a Personal Appeal.

THE British Commercial Gas Association has received the most crucial test that could be applied to it, to ascertain the genuine feelings of the subscribers regarding its value. When, under present conditions, the subscribing concerns, with few exceptions, have renewed their subscriptions, and others have raised theirs from a lower figure up to standard scale, these are acts which speak volumes as to what the subscribers think of the Association and its work for the industry. It might well have been that the prevailing unparalleled conditions, and the financial situation generally, would have been urged as an excuse by several gas undertakings for temporarily suspending or discontinuing their contributions. The contrary is the case; and therein is testimony indeed. At the same time, to maintain the work of the Association during the present period is the practical line of action that would appeal to most business men. If business and more business is the aim of normal times, then how much more important is it that new business should be cultivated and fostered to fill the valleys caused in the output curve when times are abnormal, and when repressing factors are street and shop lighting restrictions, and domestic economies enforced by the shallow purse?

The Association is not relinquishing efforts to secure a 100 per cent. representation within the subscribing ranks. We dealt with this question, and made a suggestion last December. Passages from what was then said are:

> Direct and indirect appeals by post have failed to move the purveyors of the last one-fifth part of the gas consumption of the United Kingdom. Perhaps personal influence might have better effect; and here can come in those representing subscribing undertakings. It is difficult to know how to most diplomatically handle a matter of this kind. Let us suggest that one way would be by *the administrators of undertakings that are subscribers in a county co-operating in calling a conference of the administrators of non-subscribing concerns, and so making a decided endeavour to enlist their sympathy and material support.* The work of the Association is not carried on in the interests of any particular section of the industry. It is work for all; and some of the best brains the industry possesses freely lend aid to its furtherance.

The report from the General Committee tells us that the opinion of several members is that more could be done by organized personal effort in the various districts. The idea has been developed by the Executive Committee, who propose that Membership Committees should be formed in each district to take such steps as they may deem practicable and advisable for bringing the claims of the Association before those undertakings which have not yet shown enterprise in supporting the national campaign. The nuclei of the Membership Committees are found in the District Conference Committees. Of course, such a movement will (as was hinted in the quotation above) have to be prosecuted with great diplomacy, and especially must the sympathy and co-operation be secured of the chief officers of the undertakings it is desired to approach. We are strongly of opinion that personal appeal is distinctly the best possible plan, now that most of the other means have failed of endeavouring to obtain adhesion to the organization. It is hoped that an abundant success will attend the new effort, if adopted.

The Richmond Radiometer.

IN the "JOURNAL" for Feb. 9, there appeared the first part of an article, by the Technical Staff of the Richmond Gas Stove and Meter Company, in which the defects of the "R.H.S." water-tube radiometer, which is incorporated in what is known as the "Leeds method" of gas-fire testing, were discussed. It was also indicated in the article, as well as in some editorial comments, that in the Richmond laboratories there had been devised a radiometer which, all trials demonstrated, surmounted the deficiencies of the water-tube instrument. The new radiometer, it was explained, was the subject of a patent; and on this account a short interval would be necessary between the publication of the first part of the article and the second part. This is published in to-day's issue; and it will be found to be composed principally of a description of the new apparatus and the methods of procedure in making tests with it, together with the data derived from the tests showing the constancy of the results.

In attacking the problem of the design of a radiometer which would avoid the defects found in the water-tube instrument, the Technical Staff of the Richmond Company came to the preliminary conclusion that if—instead of having to wait, when making a radiant efficiency test, until the maximum temperature has been attained, as is necessary with the water-tube instrument now employed—the results could be calculated from the rise in temperature, there would be a considerable economy of time. This conclusion, it will be seen from the article, has materialized. In the place of the water-tubes, a metal block has been adopted, of known mass and specific heat. This is placed at the requisite distance from the fire under test; and, by the aid of a properly

embedded thermometer, the rate of temperature rise is noted while the block is screened from the radiant energy of the fire, and while directly exposed to it, and then the fall of temperature is noted when the block is again shielded from the fire. It is, of course, obvious that, with the block suspended in an open room, and with an experimenter moving about near to it, there might be certain disturbing influences, the extent of which is fully discussed in the article. But even under such conditions, it has been found that, with care, fairly satisfactory results can be obtained. Constancy and reliability, however, are important in tests upon which so much depends with so many competing types of fires on the market. In order, therefore, to ensure constant conditions, the block is supported inside a small water-jacketed casing, with an aperture in front, so as to give the necessary exposure when the screen is raised. An important feature is that this water-jacketed enclosure gives a constancy sufficiently absolute for experimental purposes; and it largely does away with the necessity for the control of the temperature of the testing-room. The apparatus is robust, and is not likely to get out of order. The only fragile part is the thermometer, which can be replaced (in the event of accident) at a modest cost.

After our comments on Feb. 9, we will not, on this occasion, say more about the new instrument. But we should again like to remind readers that this new instrument does not in any way affect to do more than offer itself as a readily applicable means of measuring the radiant efficiency of gas-fires, and as a substitute in the "Leeds method" of gas-fire testing for the water-tube radiometer now employed, the deficiencies of which are very generally admitted. In previous comments, it was intimated that all the new instrument aimed at effecting was to raise the "efficiency" of the Leeds test, while substantially simplifying it, and cheapening the equipment. If this is achieved, we feel sure that the innovation will be welcomed by the members of the old Gas-Heating Research Committee. But this and other suggested improvements in the "Leeds method" will, no doubt, receive full consideration at the hands of the new Committee that was appointed last year by the Institution of Gas Engineers.

Price of Coke-Breeze for Boiler-Fuel.

In an article in other columns, a correspondent protests against the sale to electricity supply stations of coke-breeze at "low prices," seeing that the cheap fuel gives them an advantage in these times over their competitors, the gas undertakings. We sympathize with his view; but is it a fact that coke-breeze is being sold at the present time at any other than a reasonable market price to electricity generating stations? If the price is a reasonable one, then there is no ground for objection, but rather the reverse, with an eye on the future. But whether or not coke-breeze is being sold for electricity generating purposes at a price much below its relative fuel value, our contributor's article will anyway show those who have coke-breeze to vend that they should command its proper value. The ground, however, on which our correspondent makes his protest appears to be somewhat unstable. The "low prices" referred to—6s. and 8s. o½d. per ton—were quoted by Mr. Horace Boot, a consulting electrical engineer, at the meeting of an electric supply company. Our correspondent says that the prices named "seem" to indicate that some makers of coke-breeze, which is an excellent boiler fuel, are willing to sell it at a figure which does not nearly represent its full value—"at "any rate, at the present time." Mr. Boot was not alluding to the present time. He was speaking of experiments he had made in the past; and he said "at that time" the breeze was offered at 6s. per ton, and recently the price had gone up to 8s. o½d. The term "recently" has, in the mouths of some extempore speakers, an elastic meaning. If coke-breeze is being sold, or has within the past few months been sold, at these prices for electricity generation, then it is something to be deplored; but we have our doubts.

We are not so sure, too, as contended by our correspondent, that high coal costs do affect an electric light station quite as much as they do a gas-works. There is no exact ratio existing between the one and the other; and, therefore, it is difficult to subscribe to the suggestion that a rise in fuel prices must cause "a *corresponding* increase in the "price at which gas and electricity can be sold to the "public." It is roughly calculated that the total generating costs equal 25 per cent. of the sum of the expenditure (including capital charges) of a well-ordered electricity station; so that 75 per cent. of the expenditure lies in other directions. The net manufacturing costs of a gas-works may be 40 per cent. and over of the total expenditure, including capital. This being so, we are not offhand prepared to accept the view that a rise in price of fuel has a "corresponding" effect on the price of electricity as on the price of gas.

To return to the question of coke-breeze prices. The evaporative value of this material being two-thirds that of coke, there we have the first guide to the proper charge for the former. But there is one-third more coke-breeze to be handled than of coke, so that labour charges are higher. The total output of the boiler is also somewhat lower; and this is a charge against fuel. For these things, our correspondent allows 10 per cent. Supposing, therefore, coke is selling at 18s., two-thirds of this would be 12s., and less 10 per cent. we have 10s. 9½d. per ton. Now are there any gas-works selling at the present time at a figure much removed from this one? If so, there ought to be no necessity for such a course. There must, admittedly, always be an advantage in price on the inferior fuel, to justify the boiler-user taking it. Why should he cumber himself up with 150 tons of a fuel the work of which can be done, and done better (by giving him a larger boiler output), by 100 tons of another fuel, if he is not getting an advantage somewhere? We must not work too slavishly on, nor brace our arguments too tightly by, theoretical figures regarding relative values. There was a pre-war coke market; and there will be the after-war coke market. An eye has to be kept upon the after-war market; and there must be guidance in regard to it by pre-war experiences. If the right policy is not adopted now, to tempt trial and gain the advantage of experience in new quarters, there may be a reversion to the pre-war coke conditions. We have to be diplomatic and have foresight in matters commercial, especially when dealing with a competitive article. It is not sufficient to look only at to-day's value of coke-breeze as a fuel; there must be a looking forward. But there is a difference between a reasonable price and an absurdly low one. The reasonable price may secure long-year customers, where the exaction of the last penny now may deprive the gas industry of a good customer just when he would be most desirable.

Lamp Ratings and Public Deception.

There has been of late a rather persistent tendency on the part of some members of the electrical industry towards the adoption of a new rating for their lamps; and they lean towards the American idea of only marking them with, and having them known by, their total wattage. There is a question of correct principle and of practical utility about the proposal; and it is also of competitive importance to the gas industry. If the suggestion is right for electric lamps to be marked and rated on consumption instead of candle power, then it would be equally right for gas-lamps. But the "ratings" would not then be comparative with "watts" on the one hand and "cubic feet" on the other, while there is comparison with a common rating on the candle-power basis. The matter was recently brought before the Illuminating Engineering Society by Mr. F. W. Willcox; and if there was anything left unsaid in his paper in favour of wattage as against candle power, it was not due to any want of length in the contribution. The author went into all the by-ways of the subject, to find reasons in favour of the change; but we are not persuaded, by the result, to his way of thinking. To our consideration of the subject, we accept as a premiss the suggestion made, during the discussion, by Mr. F. W. Goodenough, that lamps should be marked in such a manner that the consumer can tell what he is purchasing. Would the marking of lamps by "cubic "feet" or "watts" supply the consumer with any information whatever as to the value of what he is buying? The trading custom of this country in most things has been to purchase on performance, or quality. Would anyone think of buying a motor car solely on its consumption of petrol per hour without knowing something as to the mileage run per gallon of which the car is capable? We think not.

What Mr. Willcox and those who side with him want to do is to blot-out lamp efficiency as a factor in trading, for reasons which, to say the least, are rather vague. He has in view one very benevolent object, over which he is too sanguine; and that is to help to prevent the dishonesty which, if his words mean anything at all, is extraordinarily rife in the electrical industry. We understand from him

that the proposed change was principally born of a desire to obviate the misleading values it was possible to assign, and were assigned, to electric incandescent lamps under old rating by candle power. We find him saying further that "the rating of lamps in total watts in place of candle power "forces itself into practical use partly as a defence against "abuse which has grown up with the unit of candle power." We see he also speaks about "fooling" the public. And Mr. C. H. Wordingham, in the discussion, expressed the candid view that the central station engineer seemed to fear that he would be handicapped in competition with other illuminants if he told the truth about his own lamps. However, the question is (deception on the part of the electrical industry being admitted from its own ranks), Would the proposed change effect reform? We remember how manufacturers, readers of papers, and electrical journalists, for long after the metallic filament lamp came on to the scene, spoke of them as having an efficiency of 1 candle power per watt. For example, 32 watts and 32 candles were quoted as, respectively, the energy input and the result of a certain size of lamp, when all photometricians who had gone into the matter knew very well that the figures were incorrect, and that, even in the same batch of lamps, the consumption might be anything between (say) 1·25 and 1·65 watts per candle. We get the same thing with the so-called half-watt lamp. The efficiency is stated as 1 candle per half watt, while the photometer shows that it is nearer 1 candle per 0·75 watt. But despite photometric conviction of falsehood, the misleading description continues. If we cut out of reputed efficiency tables the assigned candle power of a lamp, and leave the column stating the total wattage, we should find that, alongside where (say) 1000 candles had appeared, "500 watts" would stand. We do not see how Mr. Willcox's method of compulsorily producing truth in the electric lamp industry is going to work effectually. On the other hand, we do not believe in the old artifice of our electrical friends, of measuring the beam of maximum light from a lamp, or taking a measurement of concentrated reflected light, and giving this as the nominal candle power of a lamp. Such tricks are unfair and discreditable.

Cubic feet and wattage have both a variable relation to result, which is the main thing that the consumer cares about. But we can well understand that electricians with consciences would prefer to have ratings on wattage only, in these days when a direct candle power reading (however made) of a lamp is no criterion of the result under the conditions of the use of the lamp. It may be enclosed in glare-diminishing globes or with fittings to give indirect or semi-indirect illumination But, in any circumstance, the result from the consumers' point of view would be different from the normal candle-power rating. This, it may be said, is an argument in favour of a wattage rating only. We do not think so. The result under each one of the conditions of use has some relation to the light-emitting value of the source. Supposing a "half-watt" lamp marked 100 watts, and an ordinary wire-drawn metallic filament lamp also marked 100 watts, how is an ordinary consumer to discriminate between the one and the other, unless in some way he is informed as to the light value of each lamp, or has been educated up to making discrimination between the ugly figure of the one and the trim figure of the other? And so with gas-lamps. The cubic foot of gas has a variable value consumed by different burners or in different lamps. With one type of ordinary burner, one may realize 20 to 25 candles per cubic foot; with a lamp specially constructed for developing flame temperature at ordinary pressures, one may get (say) 35 candles per cubic foot; with high-pressure lamps, one may obtain (according to the conditions of supply) 60 candles and upwards per cubic foot. Under such circumstances, what on earth is the good of rating gas-lamps in terms of their consumption of gas, which would be subject to the further variation brought about by the requirements of the consumer, who (while producing some difference in efficiency per cubic foot of gas) adjusts by the gas-tap the quantity of light that he needs? In the case of a gas-lamp, to procure a fair comparison with an electric lamp, the maximum values possible would have to be taken. Under these circumstances, without allowing as many words to flow as Mr. Willcox found it necessary to do in trying to make out a case for wattage rating against candle-power rating, it may be said we agree with Mr. Goodenough that both factors—energy and candle power—should be quoted in the case of all lamps.

There is a preference on the part of Mr. Willcox where it is necessary to refer to efficiency, for the adoption of the "lumen," which may be defined as the flux of light required to produce an illumination of 1 foot-candle on an area of 1 square foot. The "lumen" is very well for scientific work and for use among illuminating engineers; but there is no occasion to heighten confusion in the minds of the public. "Lumens" would never be grasped by them; but the more intelligent of laymen have some appreciation, though it may be somewhat hazy, of what 1-candle power means—albeit the layman's candle is not the standard one. While on this point, may we pray for defence against all those who, however friendly, are desirous of extending gas nomenclature. We do not want any extension unless imperative. Mr. J. G. Clark suggests that the term "cubour" (which is ugly looking) might be adopted to represent a consumption of 1 cubic foot per hour; and that a consumption of 25 cubic feet per hour might be called a "Murdoch." Don't! "Cubour" and "Murdoch" nobody would know outside the lighting industries; and the more proximate we can keep our technical terms to public appreciation the better. At any rate, that is our belief.

Toluene from Beckton Gas.

A short article in another column on the toluene-recovery plant at Beckton is full of information that will be of interest to those at work in this particular direction on behalf of the country. For some time past, the Gas Light and Coke Company have been causing 15 million cubic feet of gas daily to yield up its toluene, and will shortly be treating a further 5 millions. But they are working in a somewhat different way from the system devised by Dr. W. B. Davidson [who by the way was lecturing on the subject at a meeting of the Midland Juniors last Saturday]. In his system, the wash-oil is pre-benzolized. Working on the subject for the past two years, the Beckton investigators have found that, using a limited amount of the most suitable oil in the washers, very little injury is done to the illuminating and calorific power of the gas—in other words, the effect of so working is found to be similar to using a larger proportion of oil and adding benzene to it. Only a small quantity of benzol has to be returned to the gas; and the plant required for dealing with the saturated oil is small compared with that needed when more wash-oil is used. Economical working is claimed for the system. Mr. E. V. Evans will be interested to learn that the yield of the gas is about 0·33 gallon of pure toluene per ton of coal carbonized, or (say) 2·86 lbs. From the Birmingham coal gas, about 0·4 gallon is obtained per 12,000 cubic feet of gas. Therefore, as between Beckton and Birmingham, there is not a great deal of difference in the quantity extracted from the gas made per ton.

The Selling of Sulphate of Ammonia.

Within the next few weeks sulphate of ammonia producers will be having enquiries from farmers in the vicinity of their works; so that the present is an opportune time to mention the earnest effort which should be made to place these sales through the local corn and manure merchants, in the interests of home consumption of the future. It must be obvious to those who know the methods of dealing between the corn merchant and farmers, that the form of nitrogen sold to the farmer largely depends on the persuasive powers of the former, whose opportunities of dwelling at length on the merits or demerits of any particular commodity purchased by the farmer is facilitated by weekly visits to markets, whereas the producer meets with the farmer probably only once a year. We have only to think of the value of six animated advertisements promoting the sale of sulphate of ammonia six days per week and probably two markets each per day to realize what could be done in the interest of sulphate of ammonia by corn and manure merchants throughout the kingdom. One must further realize that the merchant is like every other man—out for commercial purposes. Consequently, he gives his best energy to the commodity which pays him the best aggregate profit. Not only therefore should a fair margin of profit be allocated to the merchant for cash, but producers will be well advised to refer farmers' enquiries to their local merchants.

Standard Calorimeters and Tests.

The paragraph that appeared in "Notes from Westminster" last week under the heading "Calorific Power—The Responsi-

bility of the G.L. & C.C.," has been the subject of certain private communications—not from Victoria Street, nor from Horseferry Road. It appears to be felt by some provincial gas managements that it is not fair that the model calorific clause should tie them to the prescriptions of the Metropolitan Gas Referees in regard to apparatus and conditions of test, without any right of appeal. But the question is to whom could they appeal. The Metropolitan Gas Referees and the Chief Gas Examiner are not national institutions. They are purely Metropolitan, and the revenue for their official maintenance is drawn exclusively from the London Companies. They have no jurisdiction outside the Metropolitan area; but Parliament and suburban and provincial gas undertakings have for convenience hitherto largely adopted their prescriptions as to illuminating power. But now the model calorific clause puts upon gas undertakings the obligation to adopt the prescribed apparatus and conditions, with no provision for appeal by those managements that may at any time conclude that apparatus and conditions better fitted for total heat valuation than those prescribed are available. The Metropolitan Gas Referees did not seek this position in relation to undertakings outside the London area; and the Private Bill Authorities seem to have adopted their prescriptions with the sole view of securing uniformity. Without the right of appeal on their own account, the provincial concerns must (as we pointed out last week) fall back upon the Gas Light and Coke Company, who are entitled to have the "most suitable" apparatus prescribed by the Referees to return the maximum heat value of their gas. If the Company neglect the duty (should apparatus be available that will give a higher value), it would, of course, be against their own interests, as well as against the interests of many other concerns. Their Act of last session amended sections 9 and 14 of the London Gas Act of 1905, so as to continue to them under the calorific standard the right of appeal (possessed in reference to the illuminating power standard) to the Chief Gas Examiner against prescription or certification by the Gas Referees.

The Dye Scheme to Go Forward.

British dye users are not going to surrender to Germany, and place it in a stronger position than ever, in regard to the provisioning of this country with dyes and colours, for want of which several industries are approaching a critical stage. British Dyes, Limited, is to proceed, and build-up here an organization for ensuring supplies largely independent of Germany. That country will not be pleased; but what has happened will indubitably place it in a better position than it would have been in otherwise under the home scheme in relation to competition here. It was very generally thought that the comparative smallness of the capital subscription to British Dyes, Limited—£480,000, of which only £120,000 was free from conditions, which latter sum was the only one the Directors felt justified in considering with the Government loan in the ratio of 4 to 1, or £480,000, making £600,000 in all—was due to the want of protection for the business after the war. But at the meeting of subscribers last Wednesday, a fresh complexion was put upon the matter. By those who had drafted the scheme and by the Directors, it had been considered that the best form of protection the capital could have would be the provision of the money by the dye and colour users, and an agreement on their part that they would continue (price and quality being right) to employ the products of the Company for the definite period of five years after the war. But speaker after speaker representing important interests told the Directors that they would be prepared to substantially increase their capital-holding if the users' agreement were cancelled. The provision of capital, therefore, appears to be in the eyes of the users a secondary matter to freedom. The fact that there was only one dissentient to the proposal for the cancellation of the agreement tells of the dissatisfaction that there was over it. It is pretty certain now that all the capital required for a start in business will be obtained. The Government Grants Committee have agreed to advance £200,000 for the extension of Read Holliday and Co.'s business. This, with the sums already mentioned, will make a capital of £800,000; and another £50,000 subscription from users would command four times that amount of Government loan. The total (without conditional subscriptions) would then amount to £1,050,000; and a large part of the conditional subscription would no doubt come in, carrying with it more money from the Government.

Work and Needs.

In the result, a resolution was passed at the meeting pledging the subscribers to use their very best endeavours to support the scheme, and urging the Board to push forward with all speed in view of the gravity of the situation. Valuable time has been lost. It would have been much better if there had been earlier common action, such as that at this meeting, when the collective voice, as stated in the preceding paragraph, was in favour of throwing overboard the users' agreement. There is a lot of work to be done, and little time in which to do it, if the industries concerned are to be saved from material loss. The Directors, in addition to what will be the Company's own works, want to bring the other producers into the scheme for the national good. There are agreements to be made with them. Supplies will also be wanted from Switzerland. The Company have to encourage at home here the development of all possible sources of intermediate products, and be the channel for the supply of these to the Swiss factories, and for the purchase from them of the dyes. The Company, too, it is proposed, shall be the buyers in bulk for the users, in order to assure reasonable prices, which would be impossible if there was competition for small quantities by individual firms. There must also be organization for fair distribution. Under the circumstances, we cannot conceive how the various industries could possibly get on without a Company of the kind. The only alternative would be for the country to go cap in hand to Germany, and confess to an insufficiency of patriotism, enterprise, skill, initiative, organizing, and developing power for the purpose of building-up (gradually, it may be) an independence of Germany in this particular regard. What Germany has done, England can do if it wills; and no Britisher should be heard saying the contrary.

Scientific Men and Business.

There was talk at the meeting of the necessity of a scientific man or chemist on the Board. The scientists and chemists have felt aggrieved over their neglect of representation in the superior position, although the Company may spend well in providing for employment in chemical research and control. It seems from a statement made by Mr. James Falconer, M.P. (who presided at the meeting last Wednesday, Sir Mark Oldroyd having resigned the chairmanship through continued ill-health, while not for a moment abating his belief in the Company as a vital national necessity), that it is a matter of the selection of the right man rather than any rooted objection. The question is to get a scientific man with business aptitude; and the Directors do not want to make a mistake. But the confession of inability to make a selection rather points to the possession of a view which we will wrap-up in the statement that, while it is not rational to expect the ordinary business man to be a chemist of the first order, it is rational to suppose that, in the existing army of scientists and chemists, there is to be found a business man.

War Effects in Australia

It was not to be expected that gas undertakings in Australia, in many ways more or less dependent upon Europe for supplies, would altogether escape the adverse influences of the war; and that the effects of the commercial disorganization which has arisen have been felt over there is shown by the report of the proceedings at the recent meeting of the Australian Gaslight Company, of Sydney. Liability of vessels to seizure—the precise extent of which liability could not, of course, in the early days of the war be judged—and heavily increased premiums for war risks, decided the Directors to stop for a time all shipments from this country. But as early as November, it was deemed prudent to resume these shipments; and "they are now coming on uninterruptedly"—a striking commentary on the efficiency of our Navy. In addition to this temporary interference with the Company's operations, there have been varied local troubles which have combined to increase working costs to such an extent as to imperatively call for a rise in the price of gas. Accordingly, an increased charge was notified by the Company; but here "State regulation" stepped in, and insisted on a reversion to the lower rate. The Company, however, appealed, and got the increase sanctioned; a more reasonable attitude on the part of the authorities having followed upon a long inquiry into the matter. Outside these passing phases, the business of the Company is in an excellent position. Big extensions are being carried out; and the rapid growth in the consumption—the sales even during the past

six months were nearly 10 per cent. more than in the corresponding period of the previous year—is sufficient evidence of the need of them. Among other work newly undertaken are two retort-houses containing installations of verticals. Though the sale of cookers has for the time being, through the cessation of shipments just referred to, been somewhat interfered with, it is noteworthy that the day consumption of gas already amounts to more than one-half of the total quantity sold. On the personal side, allusion was, at the meeting, made by the Chairman to the great loss which the Company had sustained through the death some months ago of Mr. Thomas J. Bush, who for many years served the undertaking excellently well as Engineer. With the Company's regular staff, and Mr. P. C. Holmes Hunt as Consulting Engineer, the shareholders will, however, feel assured that the working operations will remain as efficient as heretofore.

And Other Matters.

So far as Melbourne is concerned, it is seen that the influence of the war forms only one of the matters calling for the anxious and careful consideration of the Directors. In fact, it would seem to be not even the most important. It is true the Chairman stated at the meeting that the combined effects of the war and the drought were increasing the amount of unemployment in the Commonwealth, and that the depression was affecting the operations of the Company, and likely to do so to a still greater extent in the future. But by far the larger portion of his lengthy address to the proprietors was occupied with the consideration of a Bill for the purpose of amending the Charter of the Company, which was introduced into the Legislative Assembly towards the close of the last parliamentary session. Time then prevented its full consideration; and it was put aside to await a more favourable opportunity, when it is to be hoped that due weight will be given to the rights of the shareholders. In certain respects the Bill as drafted would appear—judging from the Chairman's summary of its provisions—to be unduly hard upon the proprietors, who have a right to look to the proper preservation of the terms of the Charter on the faith of which they invested money in the undertaking. To the extent that it may threaten rights and privileges already legally bestowed, there is public ground for objection to the measure; but further reflection will probably induce the Legislature to modify any proposals that may have this effect. Reviewing the past year as a whole, the business of gas supply in Melbourne was decidedly good; the sales showing an increase of nearly 8 per cent. over the preceding twelve months. This may not be so large a growth as has been witnessed on some previous occasions; but it is satisfactory—particularly when prevailing adverse conditions are taken into account.

Local Authorities and Loans.

In regard to the raising of loans, local authorities are accepting the position created by national need with as much grace as they can muster. The parts of local governing bodies that appear to be stung the acutest by the order of the Treasury that they must restrict capital expenditure to the narrowest possible limits are the electricity committees; but they must perforce restrain themselves, and live-down disappointment in the knowledge that it is all for the best. Local authorities, like statutory companies, cannot now raise fresh capital without proper sanction; but in respect of the former some of the work of giving and refusing approval to new outlay has been transferred from the Treasury to the Local Government Board. The results of recent enquiries by the Board into applications for fresh loans show that they intend to maintain as rigorous a control over new expenditure as the Treasury. Nothing but health requirements, or work connected with the war, or the continuation of work already in hand which cannot be deferred without loss, will move them into assenting mood. Local authorities will, however, save themselves and the Board a heap of trouble if they will refrain from asking for sanction to expenditure which can be avoided, postponed, or reduced. Any sanction to borrowings that the Local Government Board have given subsequent to the 12th inst. holds as good as approval by the Treasury, where the money is to be raised otherwise than by the issue of stock, bonds, or bills; but sanctions of the Board anterior to the 12th inst., which have not yet been acted upon have now to receive their confirmation, unless the money is to be raised by stock, bonds, or bills, when the consent of the Treasury must be obtained, instead of the sanction of the Board. The approval of the Treasury is not required to the renewal or replacement by local authorities of maturing mortgages. The rules are not many, and they should be easily remembered.

Wiped-Joint Monopoly Claim.

No gas management will be foolish enough to submit to the claim of the Operative Plumbers that they have a monopoly to the making of wiped-joints, any more than the nations have consented to Germany's claim that its polity shall rule the world, and that it shall be top-dog in all things. The claim (not Germany's, but the plumbers') arises, as has been before pointed out, in connection with the development of business by the gas industry in water-heating apparatus; the plumbers holding that, if a gas-fitter fixes the gas portion of the apparatus, any joint that is required in the water-circulation system should be made by a plumber. The promotion of uneconomy in carrying out a job of the kind is the salient feature of the attitude of the plumbers. It is notorious that plumbing and economy never did run well together; and the plumbers evidently desire to exercise control in the maintenance of this condition. The British Commercial Gas Association have told the plumbers frankly and politely [see the report of the General Committee in other columns] that the gas industry has no intention of admitting their claim, nor of allowing them to interfere with the prompt dispatch of work by its own men. As a matter of fact, a gas-fitter who to-day cannot make a wiped-joint is not completely competent for the current work of the gas industry. At the same time, there is no intention of taking any work out of the hands of the plumbers, except such as is directly essential to the fitting-up of gas-heated water appliances. This is work that never has been in the hands of the plumbers. It is altogether new work; and, in connection with it, two bites at the cherry is not a satisfactory proceeding. The Master Heating and Domestic Engineers are on the side of the gas industry in this matter.

Increased Price in the South Suburban District.

The Directors of the South Suburban Gas Company, in a circular to the consumers, state that they greatly regret having to announce an increase in the price of gas of 5d. per 1000 cubic feet, commencing from the meter-readings for the March quarter. It is pointed out that this increase—which automatically reduces by substantial amounts both the dividend payable by the Company and the bonus to co-partners—is necessitated by the great rise in the cost of coal, consequent upon a serious shortage of supply, and unprecedentedly high charges for freight, accompanied by additional labour and other charges occasioned by the war, compensation for which at the present prices for residuals is wholly inadequate. The Directors express the hope that the coming of more favourable conditions may not be long delayed; for, they say, it will give them the greatest possible pleasure, in the interests of all concerned—consumers, proprietors, and co-partners—to revert to lower prices for gas.

Informal Meeting of Scottish Gas Managers.—We learn from the Convener (Mr. J. W. Napier, of Alloa) that the thirty-second annual informal meeting of Scottish gas managers will be held at the Grand Hotel, Glasgow, on Wednesday, the 7th prox. The President (Mr. Dugald Currie, of Airdrie) will deliver an address.

Gas from Wood Waste.—In a letter appearing in the Engineering Supplement to "The Times," Mr. E. Smith points out that leaves, loppings, roots, chips, and sawdust, and any kind of combustible refuse, will make gas for working gas-engines and supplying retorts and furnaces. He says that usually 2½ to 3 lbs. of such refuse will develop 1 B.H.P., which means that a ton will supply 100 B.H.P. per day. As no skilled attention is needed for such wood-waste gas-producing plants, the working costs are low.

Brandenburg Association of Gas, Electricity, and Water Engineers.—The programme for the thirty-sixth annual meeting of this Association, which was fixed for the 20th to the 22nd inst., included the following matters of interest to gas and water engineers. On Saturday, the 20th inst., a visit was to be paid to the No. II. Water-Works and the new plant for removing iron from the water of the Potsdam Corporation; on the next day there was to be a sitting in the "Schlaraffia" at Berlin, for the reading and discussion of four papers: "A Report on the Museum of Lighting, Heating, and Water Supply, with Notes on Ancient Modes of Lighting," by Herr A. D. A. Müller; "The Management of Gas-Works in War-time," by Herr Lempelius; "The Value of the Chemical Examination of Underground Water," by Dr. R. Haack; and "Stimulating the Introduction of Gas as Industrial Fuel," by Herr Albrecht. In the afternoon of Monday, the 22nd inst., a visit was to be made to the new Lichtenburg Gas-Works of the Berlin Corporation. A topical lecture and various entertainments to which ladies were invited were also included in the programme.

DEATH OF MR. WILLIAM LANGFORD.

We regret to record the death towards the close of last week of Mr. William Langford, the Chief Gas Engineer to the Stoke-upon-Trent Corporation. He had been subject to heart trouble, but had been able to attend to his duties; and on the 4th inst., he was present in the capacity of Chairman at the last of a series of lectures on gas heating, &c., delivered in the show-rooms of the British Gaslight Company at Hanley.

Before going to Longton, Mr. Langford was Assistant-Manager, under Mr. C. Stafford Ellery, of the Bath Gas Company, in whose service he was for upwards of twenty-two years. At Bath he gained the respect and esteem of all with whom he was associated; and these feelings found expression in presentations made to him on leaving. The Company's officials gave him a suitably inscribed watch and a set of carvers; and the workmen a handsome gilt timepiece. The Secretary (Mr. George Helps) presented the former and Mr. Ellery the latter; and both wished the recipient success in his new sphere. He obtained the appointment at Longton in the spring of 1899, as the successor of Mr. W. S. M'Gregor; and held the position till the federation of the four Potteries towns under the Stoke-upon-Trent Corporation, when he was appointed Chief Engineer and Manager of the gas undertakings. Some little difficulty arose in this connection; but the death of Mr. Edward Jones, at Burslem, and the retirement of Mr. W. Prince at Stoke, helped the Gas Committee and the Council in making their selection. The appointment was announced at the meeting of the Council in September last year. Referring to the matter, the "Staffordshire Sentinel" expressed the opinion that in Mr. Langford the county borough had a Chief Gas Engineer and Manager whose judgment was sound, whose attention to duty was proverbial, and who stood as high in his particular calling as anybody in the country. Our contemporary thought the Chairman of the Gas Committee (Alderman Mitchell), the Council, and the public might be congratulated on the new arrangement.

Mr. Langford joined the Midland Association of Gas Managers at the autumn meeting in 1899, served for several years upon the Committee, was Vice-President in 1908, and President the following year. Members of the Association will have pleasant recollections of the visit they paid to the President's town, where they were very hospitably entertained by the late venerable Mayor, Alderman Aaron Edwards, who made himself personally responsible for some of the arrangements, and won the hearts of all the visitors. At Longton both the gas and electricity works were under the supervision of Mr. Langford. He was admitted to the Gas Institute as an associate member in the year 1893, was transferred to the class of member in 1899, and passed into the present Institution.

The funeral takes place to-day, and it will be preceded by a service in the Wesleyan Chapel, Stafford Street, Longton.

PERSONAL.

Mr. William Clark Jackson, the Deputy Manager of the Merthyr Tydfil Gas-Works, has been appointed Engineer and Manager of the Neath Corporation Gas Department, in succession to Mr. R. A. Browning.

Owing to the resignation of Mr. John Witten, the Engineer and Manager of the Gorleston and Southtown Gas Company, on account of ill-health, Mr. E. F. Keable, his assistant, has been appointed to succeed him. Mr. Keable has been in the service of the Company about twelve years, for five of which he assisted in all the departments.

The Board of the American Commercial Gas Association have appointed Dr. Lee Galloway as Chairman of the Board of Educational Control and Director of the Educational Work, to which also Mr. C. W. Pratt, who has been added to the staff of the Association, will devote himself. Mr. Pratt was for a number of years connected with the Minneapolis Gas Company.

OBITUARY.

The death occurred last week, at his residence at Horsham, at a very advanced age, of Mr. Arthur Brown, who was for nearly fifty years a Director of the Aldershot Gas, Water, and District Lighting Company, and for a long period Vice-Chairman. He relinquished his seat on the Board in December, 1913; but up to within a few months of that time he was a constant attendant at the Company's meetings.

The "Journal für Gasbeleuchtung" of the 13th inst. reported that Herr W. Zachert, the Works Superintendent of the Bielefeld Corporation Gas-Works, died on Feb. 16 in the Military Hospital at Metz, in consequence of wounds received in an engagement at Pont-à-Mousson. Deceased had held his appointment at the Bielefeld Gas-Works for the past five years, and had proved himself a very capable engineer. On active service, he had the rank of Lieutenant in a Militia Regiment.

The death occurred on Monday last week, at his residence, Folkington Manor, Sussex, of Mr. James Eglinton Anderson Gwynne, M.Inst.C.E. Deceased was born in 1833, and was the eldest son of the late Mr. John Gwynne. He was formerly head of the engineering firm of Messrs. Gwynne and Co., whose works are now at Hammersmith, and who are known the world over in connection with the manufacture of gas-exhausters of the Beale and their own type, as well as other gas plant. He had four sons and three daughters. His eldest son, Colonel Reginald Gwynne, is now in Canada; his second son, Mr. Neville Gwynne, is head of the Hammersmith works; and another son is Mr. Rupert Gwynne, Member of Parliament for Eastbourne.

The death occurred last Friday, at Enfield, in his eighty-sixth year, of Colonel Sir A. P. F. C. Somerset, K.C.B., the Chairman of the Enfield Gas Company, of which he had been a Director since 1861. In connection with the record of the progress made by the Company, up to the time of its amalgamation with the Tottenham District Light, Heat, and Power Company, which appeared in the "Journal" for the 21st of July last, a portrait of Sir Alfred was given in the group of Directors and the General Manager (Mr. C. W. Offord). He received his knighthood at the coronation of King Edward. He was Honorary Colonel of the 6th Battalion Rifle Brigade, Commander of the Central London Rifle Rangers, and one of the founders, and for many years Commander, of the First Volunteer Corps in Enfield. His father, Lord John Somerset, was the commander of the heavy cavalry at Waterloo.

By the death last Wednesday, at his residence in Abbey Road, St. John's Wood, in his seventy-ninth year, of Mr. Henry Robinson, there has been removed from the ranks of civil engineers one who a few years ago occupied a foremost position. After receiving his professional education in the Applied Science Department of King's College, London, he joined the staff of the late Lord Armstrong at Elswick, and then undertook independent practice as a civil engineer, which he carried on for more than forty years in Westminster. He had charge of many important works, including railways, water supply, sewerage, and electric lighting—an example of the latter being the installation at St. Pancras. He engineered the first public hydraulic power scheme in this country at Hull, and took an active part in promoting the distribution of energy in other towns by hydraulic power, compressed air, and electricity. He contributed largely to engineering literature. He occupied the Chair of Engineering at King's College from 1880 to 1902, when he was elected Emeritus Professor.

THE GAS INDUSTRY AND THE WAR.

At the meeting of supporters of the British dye scheme, which was held in Manchester last Wednesday, to decide what should be done in view of the insufficiency of the subscriptions received, it was unanimously resolved that the Company should be proceeded with. It was stated that, to enable this to be done promises of another £200,000 would be needed; and several of those present announced their intention of increasing their subscriptions by 50 per cent., so that the additional capital required might be secured. The Deputy-Chairman (Mr. James Falconer, M.P.) presided, and announced with regret the receipt of a letter from Sir Mark Oldroyd (the Chairman) stating that he would be unable through ill-health to continue at the head of affairs.

The Local Government Board, in a circular to local authorities on the subject of the restriction of capital expenditure on works, state that, in order to avoid the duplication of labour, it has been arranged that the sanction, approval, or consent of the Board to any borrowing under powers conferred by Public General Acts or by Local Acts of Provisional Orders, shall suffice without any further approval by the Treasury where (*a*) the sanction, approval, or consent has been given on a date subsequent to March 12, and (*b*) the money proposed to be raised is to be raised otherwise than by the issue of stock, bonds, or bills. Where a local authority hold a sanction, approval, or consent of the Board of an earlier date than March 12, which has not yet been acted upon, whether wholly or in part, no further action must be taken upon it without a further sanction from the Board, unless the money is to be raised by the issue of stock, bonds, or bills, when the consent of the Treasury must be obtained. The Treasury have further decided that their approval will not henceforth be required for the renewal or replacement by local authorities of maturing mortgages. With respect to the Board's previous announcement that the inception of all new works should be avoided except such as are of pressing necessity, either for reasons of public health or on account of war requirements, it is stated that these terms will be construed in their strict sense. Consequently, before any application is made to the Board with a view to the immediate execution of works, local authorities should fully satisfy themselves that they can show that the expenditure cannot be avoided, postponed, or reduced. Any application must be accompanied by a statement of the facts upon which the local authority rely to prove these points. The Treasury are anxious that the attention of local authorities should be particularly drawn to the fact that economies and restrictions on borrowing are possible, not only as regards new works, but also as regards works in progress. As regards these latter, it will frequently be found possible by arrangement with contractors or otherwise to postpone works or parts of them, or to enlarge the period allowed under contract

for their completion. In any case in which an application for sanction to the Board or to the Treasury is necessary, where works are in progress or are the subject of a contract, it will be necessary to demonstrate that every possible effort has been made in this direction before the extent of the application has been finally determined upon.

The following notice regarding lights in London has been issued by Sir J. W. Nott-Bower (Commissioner of Police for the City):

The Secretary of State for the Home Department, under the powers conferred on him by Regulation II. of the Defence of the Realm (Consolidation) Regulations, 1914, has made an order which contains the undermentioned provisions.

On and after March 22, 1915, the provisions of the order made on Dec. 9, 1914, as to the lights in London, including paragraph 3 (as to the reduction of the inside lighting of shop-fronts), shall apply as follows:

March.—From 7 p m. till sunrise.
April.—From 7.30 p.m. till sunrise.
May.—From 8.30 p m. till sunrise.
June, and until further orders.—From 9 p.m. till sunrise.

This order shall not affect the time fixed for the carrying of a red rear light by vehicles by paragraph 10 of the order of Dec. 9, 1914.

An order issued on the 3rd inst. by the Austro-Hungarian Minister of Commerce requires all owners of stocks of gas liquor, sulphate of ammonia, and nitro-lime in Austria-Hungary to make returns of the stocks of these products held by them on that date. The returns were to have been sent in by the 18th inst. at the latest, on forms provided by the public authorities. Makers of these products were also required to give a statement of their production during the past month, and an estimate of the probable production in the current month. Similar returns will in future be required to be made by the eighth day of each month of the stocks on the last day of the preceding month, and of the production during that month. All stocks on the 3rd inst., and all of these products subsequently made, are requisitioned for war purposes, according to an order of the Ministry of Agriculture, and may not be used, worked up, or disposed of in any way except under special permit from the Ministry of Commerce.

The following remarks bearing on the position in the coal trade appeared in "The Times" last Tuesday: It was pointed out yesterday by a leading authority in the gas industry that at present all the gas undertakings in the country are straining every nerve in order to secure the manufacture of gas from coke and oil, to the great disadvantage of benzol and toluene production, which are so essential to the manufacture of high explosives. The companies were forced into this course in order to maintain a coal reserve during the present deficiency of coal supplies. It was not to be assumed that because warmer weather was approaching the trouble was over. It was very difficult to accumulate stocks, and the outlook was far from bright. Many industries to which an adequate supply of gas at a reasonable figure was a prime necessity were engaged on Government work.

The Commissioner of Police of the Metropolis (in response to a request that he should clear up doubts regarding illumination behind coloured bottles in chemists' windows and the lighting of red lamps outside surgeries) has stated that, though red is not considered a desirable colour, owing to its having been proved by aerial observations to be specially visible from above, there is no statutory prohibition against the use of red lights or shades in shop windows. Powerful lights behind red shades or coloured bottles would obviously be against the spirit of the order as to lights, and would be objected to; but there is no general intention to interfere with the limited amount of diffused light which ordinarily passes through the coloured bottles which are so familiar a sign of the chemist's shop. With regard to red lamps outside surgeries, dispensaries, &c., there is, generally speaking, no objection to the use of such lamps, provided that they are of moderate brightness, and that the tops are effectively screened.

Mr. Harold Shewring has been gazetted second lieutenant in the 11th Warwicks, and is to join his regiment at Shoreham. Until the outbreak of the war, Mr. Shewring was an assistant at the West Bromwich Gas-Works.

In the course of his Presidential Address to the Chemical Society last Thursday, Profesor W. H. Perkin said that one of the main reasons why the great dyeing industry had been lost to this country was the neglect of science in the works, and the fact that the chemists trained in organic chemistry necessary to carry on the industry in successful competition with Germany, were not to be found in our universities. Germany had recognized the value of the closest possible contact between the industries and the universities. The majority of the professors kept in touch with the large factories; and appreciation by the manufacturers of the value of science in connection with industry was one of the reasons for the rise and development of the German chemical works. As to the grant of £100,000 which the Government proposed to make to British Dyes Limited for research purposes, the money would be better employed in subsidizing the research laboratories of those universities and colleges willing to specialize in organic chemistry, and to train a certain number of students with a view to their entering the service of the Company. German works with which the new British Company must compete were enormous organizations, controlling almost unlimited resources; and if after the war these organizations continued to work with the same efficiency as before, some years must elapse before we could compete successfully with them. Many were of the opinion that, to prevent unfair methods of competition, the Government should protect the industry by placing an import duty on all German dyes and other organic products. Failure to develop on research lines was scarcely conceivable if the works were in the hands of a highly trained chemical staff; but if the new industries got into the power of the business man who wanted an immediate return for his outlay, and who failed to appreciate the vital importance of scientific control, then no tariff could avert disaster.

The special correspondent of the "Daily Telegraph," referring to last week's Zeppelin raids on Paris, says: The danger of the first raid was considered over at 10.30. Firemen dashed down the streets blowing their bugles; and the lights began to reappear. Barely half-an-hour later, the bugles sounded the "garde à vous" again; and the lights were once more extinguished. This was the nethermost darkness, to which the earlier was incandescent; and it lasted till 2.45 a.m., when, once more, the indefatigable firemen went their rounds, clamouring this time a definite security. The darkness of a great city is something far more positive than the kindly darkness of the countryside. It is something that strikes all the senses, that can be touched, seen, felt, that you can almost taste and smell.

A Taube flew over Calais early last Saturday morning, and dropped bombs near the gas-works in the Rue Moulin Brulé. Windows in the building were smashed.

It is stated in a message from Warsaw that since the opening of the war, the important local gas concern (a German enterprise) has been taken over by the town authorities. The new management does not purpose continuing the working-up of ammonia. And as this was practically the only gas-works in the country producing the article, consumers are put into a difficult position.

At the outbreak of the war, it was supposed that the importation of nitrate of thorium into Japan would be stopped. This caused a great deal of uneasiness among the gas companies as to the future peaceful management of the business; and some alarm was felt as to the future supply of gas. We learn, however, from the "Journal of the Imperial Gas Association," that since then first one means and then another have been found by which business can be continued without serious loss or hindrance. Some agents have managed to import the commodity referred to, and the gas companies are in a somewhat improved condition, and have been relieved of the anxiety felt at the beginning of the war.

Some highly important research work is being carried on at the Manchester School of Technology; and, in an interview, Mr. J. Maxwell Garnett (Principal of the School) states that valuable results have already been achieved. The chemical department has been mainly concerned with explosives and dyestuffs, and the textile department has been working upon aeroplane cloths. In regard to the engineering department, Mr. Garnett said he could not make any observation, as this part of the work was strictly secret. One of the school chemists, he added, had been called to Woolwich to produce some of his work, which, if it stood the test of the authorities, would be the most important discovery brought to their notice for many months.

Increased Price in Wandsworth, Wimbledon, and Epsom.

The Directors of the Wandsworth, Wimbledon, and Epsom District Gas Company notify consumers that they find themselves unable to meet the heavy charges they must incur under the existing circumstances, and much regret that the price of gas will be increased by 4d. per 1000 cubic feet from the taking of the indices at the Lady-day quarter. The heavy advances in the cost of coals and other necessary materials, the successive increases in wages and war food allowances, the provision for dependants of a large contingent of their employees who have gone to the defence of the country, have, they say, already depleted the funds of the Company; and the consumers should note that, by force of the Company's Act, the advance will automatically reduce the future dividends by the sliding-scale. It further, unfortunately, reduces the profit-sharing bonus to be received by the employees of all grades. The consumers, therefore, will understand that, in view of these circumstances, the price will be again reduced at the earliest opportunity. The increases will apply to all consumers in all areas supplied by the Company, in conformity with the Company's Act of 1912.

We have received from Messrs. Crosby, Lockwood, and Son a copy of a book entitled "Dye-Stuffs and Coal-Tar Products: Their Chemistry, Manufacture, and Application," by Thomas Beacall, B.A., F. Challenger, Ph.D., B.Sc., Geoffrey Martin, Ph.D., M.Sc., B.Sc., and Henry J. S. Sand, D.Sc., Ph.D. The price of the book is 7s. 6d. net. The subjects dealt with by the authors will be reviewed in a subsequent issue of the "JOURNAL."

TAR AND PITCH PRICES.

As indicated in the "JOURNAL" for March 16 (pp. 645 and 689), it is now possible to insert the value of the pitch portion of the tar from Aug. 17, 1914, to the 22nd of March this year. From Sept. 21 last there has been given week by week a value for the liquid products contained in one ton of tar. We now publish a list of the full value of such tar for these periods, pitch included.

Date.		Liquid Products.	All Products.
	1914.	s. d. s. d.	s. d. s. d.
August	17	—	25 0 to 29 0
	24	—	24 6 ,, 28 6
September	1	—	24 0 ,, 28 0
	7	—	23 6 ,, 27 6
	14	—	23 3 ,, 27 3
	21	15 9 to 17 3	23 0 ,, 27 0
	28	15 9 ,, 17 3	23 0 ,, 27 0
October	5	15 9 ,, 17 3	23 0 ,, 27 0
	12	15 9 ,, 17 3	23 0 ,, 27 0
	19	15 9 ,, 17 3	23 0 ,, 27 0
	26	16 0 ,, 17 6	23 3 ,, 27 3
November	2	15 9 ,, 17 3	22 9 ,, 26 9
	9	16 6 ,, 18 0	23 9 ,, 27 9
	16	16 6 ,, 18 0	23 9 ,, 27 9
	23	16 6 ,, 18 0	23 9 ,, 27 9
	30	16 6 ,, 18 0	23 9 ,, 27 9
December	7	16 6 ,, 18 0	21 9 ,, 25 9
	14	16 9 ,, 18 3	22 0 ,, 26 0
	21	16 9 ,, 18 3	22 0 ,, 26 0
	28	16 9 ,, 18 3	22 0 ,, 26 0
	1915.		
January	4	17 0 ,, 18 6	22 3 ,, 26 3
	11	17 0 ,, 18 6	22 3 ,, 26 3
	18	17 0 ,, 18 6	22 3 ,, 26 3
	25	17 0 ,, 18 6	22 3 ,, 26 3
February	1	17 0 ,, 18 6	22 3 ,, 26 3
	8	17 0 ,, 18 6	22 3 ,, 26 3
	15	17 0 ,, 18 6	22 3 ,, 26 3
	22	27 0 ,, 18 6	22 3 ,, 26 3
March	1	17 0 ,, 18 0	22 3 ,, 26 3
	8	17 0 ,, 18 0	22 3 ,, 26 3
	15	—	20 6 ,, 24 6
	22	—	21 0 ,, 25 0

ELECTRICITY SUPPLY MEMORANDA.

A WISER man is Mr. W. R. Cooper to-day than he was before he read his paper to the Institution of Electrical Engineers on the subject of experiences in his own household with electric cooking.

The Penalty of Telling the Truth.

The paper was noticed in the "Memoranda" last week. He has learned that it is treason in the electrical industry to tell the truth regarding one's personal experiences, if the experiences are not exquisitely favourable to electrical operation. The spirit in which Mr. Cooper's paper was received is illustrated by the reported remark of Mr. A. H. Seabrook (the tenor of whose homilies to young men was uprightness in all things) that, "if they found they could not do things electrically, they should keep quiet about it." Another version of Mr. Seabrook's remark is that it "was a case of saving us from our friends; he strongly deprecated the publication of such doubtful results." Mr. Cooper must feel that his transparently honest statement of facts obtained from his own experience, and that of nobody else (as is made quite plain), has been, by his incensed electrical friends, treated in a manner which affects to label him a dishonest person, and a betrayer of the industry of which he is a professional member. The label will not stick. In his reply to the discussion, Mr. Cooper got one back on his critics. He let out the secret for all the objection raised to a man telling the truth regarding his experiences on the subject of cooking by the electrical mode. Certain members of the Institution, it seems, "have got such an extremely high opinion of the gas technical press that they felt they could not say anything about a subject for fear of the gas journals getting hold of it." This was an unkind smack at a species of cowardice which has also had plentiful exemplification in the defamation of gas, and the display of soiled pairs of heels when called to account. Electrical men should not labour under the mistake that silence on their part would deprive the gas industry of knowledge of the other side of the question. There is the direct experimental source of information, and experience reaches gas undertakings from users, and without much asking. Mr. Cooper also happens to be the Editor of the "Electrician;" and certain of his journalistic colleagues find considerable support, of which they eagerly availed themselves, in remarks made during the discussion of the paper, for chiding him upon his revelations. He seems to be, in the eyes of one or two of them, little short of a traitor. "Meteor" speaks not unkindly. The "Electrical Review" has climbed on to a high pedestal, and looks at Mr. Cooper through the wrong end of a telescope, and naturally finds something very insignificant at the other end. "It is unfortunate," say the loftily perched Editors, "that the author should have chosen to play the part of an investigator of electrical cooking methods, and still more unfortunate that he should have thought it necessary to place his experience on record, as he might have known that his results had been bettered in everyday practice by users all over the country." Poor man! And his crime is that he only accurately stated his own daily experiences, and did not claim that they were those of anyone else—in fact, he made their individuality abundantly clear. But the amusing thing is that the "Review" uses other individual experiences collected from the discussion to show that Mr. Cooper is wrong. These experiences came from expert electricians, some of whom are impressed with the excellence of the policy advocated by Mr. Seabrook of only publishing the best, and leaving all else unsaid. "Electrical Industries" remarks: "It is not surprising that the men who have spent years in acquiring experience of electric cooking under all conditions, and in building up its popularity, should feel resentment against the Institution for presenting the achievements of a single kitchen as worthy of serious discussion." The British Association for the Advancement of Science once gave Professor J. T. Morris a platform for the telling of his experience with a small electric-cooker in the single kitchen of a London flat.

Costs and Consumption.

In the discussion upon the paper, there was criticism as to the cost of making installation of electric-cooking apparatus in Mr. Cooper's kitchen. Most speakers were of opinion that this gentleman had paid through the nose for an installation which he desired should be useful and proof (so far as he could make it) against misadventure. But any way all the figures quoted under this head showed that not only is installation of electric-cooking apparatus far more expensive than gas apparatus, but that maintenance is a very important item, owing to breakdowns. If a user of an electric-oven has no experience of breakdowns, he is an extremely lucky person. Mr. R. S. Downe, who is associated with the Brompton and Kensington Electrical Accessories Company, stated that an electric-cooker could be hired (there are about 100 out on hire in the area) for the modest sum of 5s. to 7s. 6d. per quarter; the wiring and installation costing about £14. Mr. Seabrook, too, thought that the £45 paid by Mr. Cooper was utterly ridiculous. But the £14 installation would not be on all-fours with the author's. In view of the heavy expense of installation, it was insisted during the discussion that hiring-out facilities are absolutely essential to assist the progress of electric cooking, which is not to be wondered at. Mr. Cooper was also called to account for quoting 2 units per head per day as the consumption for electric cooking; but the impossibility of quoting any figure (the requirements and habits of no two households being the same) was shown by the figures quoted by different speakers—these ranging from 0·79 unit to 1¾ units. Professor Morris's experience gives him the last-named figure. Mr. Cooper's statement was about 2 units in the winter time and 1·6 units in the summer; so that his average would not be far in excess of that of Professor Morris.

Trouble for Users.

In the course of the discussion, there was some very plain speaking regarding the troubles and inconveniences to which householders and others expose themselves who adopt electric-cookers. We have also had a good deal of independent testimony regarding this from users. Those who suffer least are those with electrical apparatus under frequent expert supervision. It has been gathered from Mr. Seabrook upon previous occasions how often gentlemanly inspectors and silver-tongued pacificators visit any Marylebone houses with electric-cooking apparatus in them. Mr. George Wilkinson, the Electrical Engineer of Harrogate, looks upon maintenance as a serious matter, and is not enthusiastic about cooker designs. He stated frankly in the discussion that he is already using his fourth electric-cooker, and with this he has had three hot-plate failures in eighteen months. For repairing hot-plates alone, he says, it would cost consumers about 10s. 6d. every six months! It is his considered opinion that, notwithstanding all the progress made with electric-cookers, they are not yet in a condition which enables central station engineers without qualification to recommend them to consumers. Mr. Wilkinson evidently prefers truth to pretence. The writer of the "Memoranda" has been a user of gas-cookers for 28 years, and has never yet had a breakdown; and repairs have been rare. It is likewise the conviction of Mr. C. H. Wordingham that there is much room for material improvement in the design of electric-cookers; and he has no great confidence that station engineers will put in their own apparatus, and pay for the current used. Electric ranges will, he added, have to be a good deal more reliable, and free from repairs, before they will stand the ordinary cook. It is Mr. Duncan Watson's view that a successful electrical apparatus for the kitchen in the future must be something in the form of an armoured submarine, or something that will resist the onslaughts of the cook. Until such an apparatus is forthcoming, the question of maintenance will have to be seriously considered. We wonder whether Mr. Wordingham's philosophic words fell into absorbing ears when he said that nothing would retard electric cooking more than claiming for it things it would not do. Very uneasy must have sat Mr. Seabrook, of Marylebone, and Mr. Grogan, the

"Tricity" cooker platform demonstrator, orator, expert in the use of scientific gas-testing apparatus, and learned in the thermal differences produced by slight variations of gas pressure. At least he thinks he is all that; but he shrewdly declines public examination, demonstration, and exposure of his beliefs in the latter connections.

Shrinkage.

It will be remembered that the author in his paper pointed out what is correct, that shrinkage in the weight of meat during cooking in an oven is an effect of temperature and constitution, and not of the means employed. The few people who hold the contrary view merely do so either because they have not sufficient brain power to form an opinion of their own, and so adopt unquestioned and unconsidered the statements of people with electric cookers for sale, or because (being impervious to ridicule from others) it suits their purpose to try to keep alive an exploded postulation of the electric-cooker bagman. "Meteor" cannot shake off this last shred of pretence in favour of the electric-cooker "Desiccated meat," he writes (as he has written so often before) "is the crowning sin of the gas-oven; it cooks, but it nearly incinerates." One word of comment suffices: Baby! The large hotels, restaurants, and clubs of the West-end continue to please their customers. There was common sense, and a refusal to be tied to the coat-tails of the electric-cooker salesman, in what Mr. Cooper had to say on the subject. The same characteristic is the foundation of Mr. Wordingham's remark, that excessive heat is responsible for loss of weight when cooking joints—whether the agent employed be coal gas or electricity. Possibly, with memories of many an excellent gas-cooked dinner, Mr. W. M. Mordey is manifestly persuaded that water evaporation is largely responsible for loss of weight between raw and roasted or baked meats. Mr. A. Nichols Moore deprecated what he truly terms the "absurd propaganda" as to saving in weight by electric cooking; and he very properly added that the cooking of meat forms a very small proportion of the work done on a range, and the saving effected is negligible compared with the total consumption. And after these robust common-sense views, and their huge daily confirmation, the little squeak of "Meteor" about "desiccated" meat and "incineration" is something to be treated with contempt.

Coke for Water Heating.

One of the features of the discussion was the amount of testimony given by the electricians to the economy of gas coke for water heating for domestic and other purposes (nothing was said about heating by gas). Mr. George Wilkinson gave an opening. He mentioned that he heats up 12 gallons of water to 180° Fahr. on an average consumption per day of 12·8 units of electricity; and he uses the water for washing, for baths, and drinking purposes. Heavens! His household must be very sparing of water. We cannot see 12 gallons going far in our bath; and we cannot think that many members of Mr. Wilkinson's family enjoy a hot bath the same day—*plus* water for other washing purposes and drinking. Mr. Wordingham thinks 12 gallons of water not of much use; what is wanted in a household is an unlimited supply. Electric water heating, he added, should be left severely alone; no amount of juggling with tariffs and load factors would enable electricity to compete with coal for water-heating. If coal, then coke. Mr. R. S. Downe agreed as to the impracticability of heating water electrically on a commercial footing. The electric water-heater that he used to have at the Brompton and Kensington restaurant consumed 480 units ["daily," in "Electrical Times" report], which, at ½d. per unit, amounted to £1. He finds a coke-boiler affords him a good supply for 7s. per week! Mr. Grogan agreed with other speakers on the subject of the utility of the gas-coke boiler. Using electricity at only 0·25d. per unit, with a 500-watt water-heater, the cost would amount to £4 11s. 3d. per annum; and the quantity of hot water resulting is infinitesimal compared with the amount supplied from a coke-boiler, only costing from 1s. to 2s. per week, according to the size of family. He mentioned the experience of a house with a family of eight, in which a coke-boiler gives an unlimited supply of hot water for 2s. per week. Professor Morris, too, by the same means gets all the hot water he requires for 3d. per day. Poor Mr. Seabrook! He had to sit and listen to all this from electricians, after having said so much about hot-water supply to certain undergrc und conveniences. The reports of the discussion do not record that he was able to get out the word "convenience" on this occasion.

Those Wicked Coal Contractors.

A communicated article has appeared in the "Electrical Review" under the heading of "The Effect of the Present Coal Position on the Business of Electricity Supply." The article has been carefully read, but a categorical statement as to the "effect" is prominent by its absence. The article is a fully justified grumble at the position generally. Certain suggestions are considered for mending the position. Some are admitted to be impracticable; and the others may be taken to possess the same characteristic. It appears that the writer of the article is a central station engineer, and he has had bitter and costly experience with his coal contractors. Certain gas-works administrators say they have had the same, and they have not hesitated to tell Mr. Runciman so at the Board of Trade. Some of the coal contractors are all for the main chance; some are not. We will not mention names lest they are overwhelmed with offers of new business. But this writer says his own experience is that of central station engineers up and down the country. The contractors, if they can get higher prices for coal, will not, he alleges, supply under their contracts, excusing themselves by declaring they cannot get the coal. He hints at some other questionable proceedings. A contractor will say he is sorry he cannot obtain coal to supply under his contract; but, if the central station engineer cares to have the coal, he (the contractor) can get some from another firm at a price 60 to 70 per cent. higher than the contract figure. That shortage of coal supply and waggons are exaggerated excuses, he says, is proved by the fact that, if an engineer agrees to pay the extortionate price asked for fuel, he continues to get just sufficient to keep him going at the enhanced price. He thinks that the prosecution of these offenders should be taken up by a combination of consumers, and an example be made of them. But what is going to happen if there is not sufficient proof to secure conviction? However, that is one idea. Another is that municipal coal-using concerns should become colliery owners; but this is dismissed as impracticable. Increased coal storage the writer does not like, as it means additional handling in and out of store, valuable space is occupied, and (so he says) calorific power suffers great depreciation unless the coal is periodically worked-out of stock and then renewed. We do not think there is really any such material reduction of calorific power. There is also spontaneous combustion. On the other hand, protection of supply demands good storage. So far all the suggestions fail as satisfactory remedial measures. Then the complainer arrives at his final suggestion. It is that one of the existing organizations should move the Government in the matter; or failing this, an Association should be formed to influence members of Parliament to take up the passing of a measure to put the supply of coal to power stations on the same basis as the supply of war material. A great deal has been done lately in an attempt to move the Government. Whether there is to be any result from it cannot be said, as all is a blank, so far as information goes, since the courteous reception by, and on behalf of, the President of the Board of Trade, of representative men of the gas and electricity industries. However, coal contractors will perhaps derive some satisfaction from knowing precisely how they are regarded by the station engineer responsible for the article under review. They are, we read, indifferent to all considerations other than those of profit, and should be treated as unpatriotic and untrustworthy. From this they certainly seem to be a very bad lot.

Comparing Increases of Price.

Some electricity concerns in view of the increased price of coal delivered, and the reduction of business owing to the suppression of shop lighting and the restriction of street lighting, have raised the price of current, and several others are considering the matter. Some of the London Electricity Supply Companies are among those who have made increases; the chairmen of other of the companies have said that the advancing of prices is a matter which, under present circumstances, cannot be much longer deferred. The Electricity Committee of the Marylebone Borough Council are considering a 5 per cent. all-round increase. The Brighton Corporation have raised their tariffs throughout—generally speaking, by ½d. per unit, and street lighting by ¾d.; and the only electricity consuming people in Brighton who seem to have escaped are those very few who use current for cooking. The Kingston electricity undertaking, which the "Surrey Comet" describes as an "ill-starred business," has decided to put 10 per cent. on all charges. Other examples of increases could be quoted; but this is unnecessary. There are people in the electricity supply industry who are priding themselves on the fact that certain gas companies (they do not say anything about those who have not had occasion to raise the price, and have no immediate intention of doing so) have had to increase their charges by 20 to 25 per cent., while electricity undertakings that have made increases have not found it necessary to go so high as this. Some electricity concerns do not fall very far behind. But there is no equality in the contrast. Of the total charges coming upon an electricity station, roughly speaking, only 25 per cent. is attributable to generating costs—the remaining 75 per cent. being due to distribution, capital, and other charges. In gas supply, the conditions are entirely reversed. Of the constituent charges per 1000 cubic feet, the manufacturing costs are the heaviest. The increases in the prices of gas have relation more to those concerns which have had to bring supplies of coal a long distance—particularly those whose situation and equipment make them dependent on sea-borne coal. Were it not for this—even with the reduction of business due to diminution of street and outside shop-lighting, the increase in the price of coal, under coming contracts, and the special charges due to the payment of the men at the front and their dependants—it is quite likely that the higher values now being obtained for residual products would have gone a long way towards staving-off an advance in gas prices. It ought to be remembered, when electricians make comparisons under present circumstances, that, in relation to business done, a gas undertaking has to pay for the carriage of a much larger quantity of raw material than an electrical undertaking.

The Institution of Mechanical Engineers have issued a notice that applications for grants in aid of original research in mechanical engineering to be made under the terms of the "Bryan Donkin Fund" should be sent to the Council before Oct. 11 next.

THE RICHMOND RADIOMETER FOR GAS-FIRE TESTING.*

PART II.

[A Communication from the Research Department of the Richmond Gas Stove and Meter Company, Limited.]

In the type of radiometer discussed in Part I.† the tubes are exposed to the fire until such time as a steady temperature state is attained. A constant stream of water being maintained, the heat absorbed is obtained from the product: "Rate of Water Flow × Total Temperature Rise."

It appeared to us that there would be a marked saving in time if an apparatus were constructed in which there was measured the rate of rise of temperature of a given mass of absorbent. It is conceivable that satisfactory results might be obtained by taking a metal block, of a good conducting material and known specific heat, exposing it to the fire, and noting the rates of increase of temperature over a period of time. It was decided to carry out experiments with such an arrangement. For the purpose of recording the temperature a small hole was drilled in the block along a vertical axis to a suitable distance from the top. Into this hole a thermometer bulb was placed, and the surrounding space filled up with mercury. The block was suspended from a suitable support and made to project about 6 inches beyond the edge of the table on which the support was clamped. In this way it was ensured that the results should not be vitiated owing to the existence of hot convection currents produced by the heating-up of the table legs and frame work by the heat from the fire when exposed to the latter during the progress of the experiment. A screen composed of three polished copper plates was provided for insertion between the block and the fuel under examination when desired.

With this simple type of apparatus, surprisingly concordant results were obtained in the fire-test room which was constructed specially for the purpose of the Leeds test, and enables a fairly constant air temperature to be maintained. Certain difficulties were experienced, however, in adjusting the various blocks employed to test the soundness of the method in the required position; and it is obvious that, unless care is observed, the results might be upset by a draught, or by the impinging of the experimenter's breath on to the block. Further, it is desirable that the projecting thermometer stem shall be protected from the radiating source. For these reasons, at a later date it was decided to enclose the absorbing block in a water jacketed space, from which it was insulated. A steady stream of water could be circulated through such an enclosure, and the latter thus be maintained in a steady temperature state. An apparatus of this type is shown in fig. 3, in which A is the metal block; B the thermometer in mercury; D the water jacket of metal, nickel plated and polished, provided with an opening E, 6 in. by 6 in.; a double screen F held at a suitable distance from the front of the water-jacket and arranged so that it can be raised or lowered quickly when required; pointed cork studs G, pointed cork stud G_1 adjustable by screw for clamping the block, a thermometer shield I, and a nickel plated and polished metal shield J to prevent the heating up of the table top and the formation of convection currents during the experiment.

Fig. 4 shows a photograph of a compact and more easily portable form of the radiometer which is being experimented with at present. This form of the instrument is of very modest proportions, and can easily be handled.

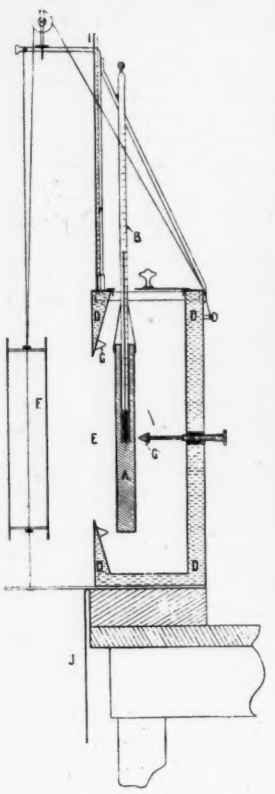


Fig. 3.

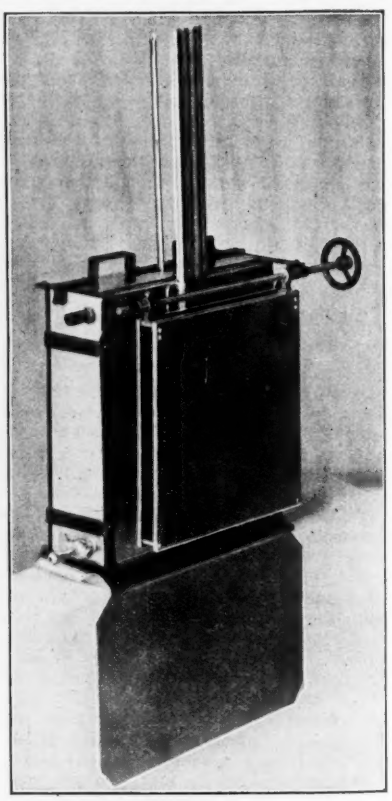


Fig. 4.

Method of Procedure in Using the New Radiometer.

As in the case of the R.H.S. radiometer so with this instrument—a correction has to be applied to compensate for the transmission of heat between the block and the surroundings. As the temperature of the block is continually changing, the amount of this correction will vary from minute to minute. The observations must thus be made in such a way as to allow in these special circumstances of the calculation of the correction with sufficient accuracy.

The actual procedure for a detailed observation is as follows: The apparatus is placed in position opposite the centre of the fire with the front face of the enclosure at a distance of 34·4 inches from the fire.‡ The metal block is screened from the fire by the polished shield, and half-minute observations are made of the temperature for five minutes (§). At the end of 5½ minutes the screens are quickly removed, and the half-minute observations continued. The block is exposed to the radiations from the fire for a period of six minutes, at the end of which time the screens are again interposed. The half-minute observations are continued during a further six minutes.*

The initial and final sets of observations enable the rates of cooling of the block at the mean temperature of the beginning and the end periods to be easily calculated. Then, assuming that the rate of change of the cooling rate is constant per degree over this temperature interval, the actual cooling during each half-minute of the period of exposure to the fire can be calculated. The algebraic sum of these different corrections gives the net correction to be applied. The difference between the corrected end temperature T_c and the initial temperature T_i of the block just as the screen was removed, gives the rise in temperature which would be produced by the heat radiated from the fire on to the 6-in. by 6-in. area if no cooling had occurred.

The heat capacity of the mercury and the thermometer is added to that of the block. To estimate the heat capacity of the thermometer, advantage is taken of the fact that the volume of specific heats of glass and mercury are practically equal to 0·46 per c.c. Thus, it is only necessary to determine the volume of the immersed portion of the thermometer. This can be conveniently done by finding the increase in weight in grammes of a beaker of water when the thermometer suspended from an extraneous support is immersed to the same depth as in the block.†

Full details of the calculation of the result are given in the appendix.

Thus if—

H = heat radiated to the block.
S = specific heat of the block.
M = mass of the block.
N = water equivalent of the mercury and the thermometer bulb.

Then—

$$H = (MS + N)(T_c - T_i).$$

Further, if a = the area of the opening‡ in the front of the enclosure in square inches, then the centre reading for the Leeds test H_c is given by $H_c = \frac{144}{a} H$.

There will now be cited some of the experiments which have been carried on to ensure the following points: (1) That the

* Provisional Patent No. 1733; Feb. 3, 1915.

† See "Journal" for Feb. 9, p. 316.

‡ When the instrument is provided with a 6-in. by 6-in. block, and a correspondingly larger orifice to the enclosure, the distance is measured from the face of the block.

§ No observations need be taken at the end of 2½ minutes from the start, or, if taken, it is omitted from the subsequent calculation.

* In case of necessity, when there is any indication of lag or of excessive temperature fall of the thermometer during the initial stages of this period, the cooling should be prolonged to ensure the true rate being determined.

† Ostwald, "Physico-Chemical Measurements," p. 121.

‡ Or of the block if the size of the latter is the determining factor.

position of the thermometer allows of the mean rate of change of the temperature of the block being determined with a sufficient degree of accuracy; (2) that the cooling correction is sufficiently accurate; (3) that the water-jacket forms an enclosure at a sufficiently constant temperature; (4) that constant results are really obtainable.

Determination of the Change of Temperature of the Heat Absorbent.

The thermometer employed is graduated in 1/10° C. and can be read to 1/100° C. It is surrounded by mercury in a small hole in the metal block, as already indicated. The layer of metal on which the radiations from the fire fall will be at a slightly higher temperature than that actually recorded by the thermometer, which, in turn, should also record a slightly higher temperature than the back face of the block. The hole is equidistant from the front and back faces, and, in addition, the sides of the block can be polished, so that the variation of the thermometer reading due to the block from the mean of the temperatures of the front and back faces may be reduced to a negligible quantity. The extent of the lag in temperature recorded by a given thermometer behind the temperature of the front face will vary so far as the block is concerned with: (1) The thickness of the block; (2) the specific heat and mass of the metal; (3) the conductivity of the metal; (4) the rate of rise of temperature of the block.

If the temperature lag is of such an order as to affect the recorded rates of cooling of the block or the cooling correction to be applied, it ought to be possible to detect this by largely varying the above factors.

In addition to the lag attributable directly to the metal block there is an amount of lag dependent upon the nature of the thermometer used. This may be attributed to one or more of the following factors: (1) Inertia; (2) lag due to rate of heating-up; (3) sensibility of the thermometer to small temperature changes. In the preliminary investigation of these points, copper blocks were employed. Three were cast each of a superficial area of 36 square inches and of approximate thickness (*a*) ½ inch, (*b*) ¾ inch, (*c*) 1½ inches. Block (*c*) was useless, as it contained too many holes.

Then, again, experiments were made with cast-iron blocks (*a*) ¾ inch, (*b*) 1½ inches thick. Tests were carried out separately with each of these blocks suspended at a distance of 34·4 inches from a gas-fire, and not protected by a shield. The front faces of the blocks were blackened, the sides and backs polished. In the case of the iron blocks, the sides and back were first nickel-plated. In conjunction with the radiation determinations, observations of the gas consumption and calorific value were made. The following results were obtained; the blocks being exposed to the fire for a period of six minutes in each case.

Table V.

Block.	Temperature Range of Experiments.	Net Rise in Temperature.	Net Calorific Value.	Net Gas Consumption Cb. Ft. per hr.	Total K.C.U. Available.	Centre Reading K.C.U. per hr. H_c.	$H_c \div$ K.C.U. Available.
Copper ½-inch thick	19·6 – 32·65	13·42	153·5	32·72	5022	122·0	0·2429
do.	31·5 – 42·3	13·29	153·5	32·72	5022	121·0	0·2409
						Mean	0·2419
Copper ¾-inch thick	22·40 – 32·46	10·61	153·5	32·72	5022	122·0	0·2429
do.	31·59 – 40·20	10·44	153·5	32·72	5022	120·0	0·2389
						Mean	0·2409
Iron block ¾-inch thick	26·03 – 34·33	8·71	153·7	32·75	5034	122·4	0·2431
do.	33·70 – 40·86	8·53	153·7	32·75	5034	120·4	0·2391
						Mean	0·2411
Iron block 1½ inches thick	21·90 – 26·50	4·30	153·7	32·75	5034	123·1	0·2445
do.	26·50 – 30·70	4·31	153·7	32·75	5034	123 4	0·2451
						Mean	0·2446

The maximum variation of 0·0040 in the factor is equivalent to a difference of 2 K.C.U. per hour in the centre reading; and it is to be noted that this difference was obtained in two experiments with the one block. The difference between the mean values is approximately equivalent to 0·5 K.C.U. per hour.

In the case of the iron blocks the maximum variation is equivalent to 3 K.C.U. per hour. There is a variation of 2 K.C.U. between consecutive determinations with the one block. The difference between the mean values equals 2 K.C.U. per hour.

The variations introduced in the above-experiments in the various factors previously mentioned are as follows:—

	Copper.	Iron.
Specific heat	0·0925	0·114
Conductivity	0·918	0·138
Net rate of change of temperature ° C. per min.	(1) 2·24	1·45
	(2) 1·77	0·72

An examination in detail of one of the determinations with the thick iron block is of interest, as the existence of the lag in the temperature readings in that case is very distinctly noticeable.

Table VI.

Screen in Front.	Screen Removed.	Screen Replaced.
0 min. 26·50	6 min. 26·80	12 min. 30·70
	27·20	30·70
½ ,, 26 50	7 ,, 27·54	13 ,, 30·70
	27·89	30·68
1 ,, 26·50	8 ,, 28·24	14 ,, 30·65
—	28·60	30·63
5 ,, 26·50	9 ,, 28 95	15 ,, 30·62
5½ ,, — screen removed	29·30	30·60
	10 ,, 29·64	16 ,, 30·60
	29·99	30·60
	11 ,, 30 31	17 ,, 30·58
	30·67	30·57
		18 ,, 30·54
		30·52

In the first half minute after replacing the screen the temperature, as recorded by the thermometer, actually rose, and it was not until 1½ minutes after the screen was replaced that the temperature fell at all noticeably. It is possible that the halt at 30·70° C. was to some extent due to an inherent weakness in the thermometer. The end period was prolonged to ensure the true cooling rate being found.

The results obtained in these experiments were on the whole satisfactory, as the variations in the results registered with the blocks of different thickness were no greater than those in individual experiments with the same block.

For a given thermometer the lag varies as the rate of heating-up; but in the preceding cases the apparent lag is greatest when the rate of heating-up is least. Thus it would appear that the decrease in thickness of the blocks more than counterbalanced the effect due to the increase in the rate of heating-up. With a block of medium thickness the accuracy need not be interfered with on the score of lag. It appears possible to make the lag due to the block less than that due to the ordinary thermometer, the accuracy obtainable with which is probably sufficient for gas-fire testing purposes.

When necessary, to prevent any chemical action between the mercury in which the thermometer bulb is immersed and the metal of the block, olive oil is first poured into the hole and then emptied out. The residual oily layer which adheres to the metal has been found to provide ample protection for a considerable period. The film is very attenuated and has thus an extremely low thermal capacity and does not affect appreciably the rate of temperature change of the thermometer.

The results for the centre reading do not appear to be affected by the position of the thermometer bulb relative to the top of the block, provided the bulb is completely covered with mercury. Results 3 and 4 in Table X. provide experimental confirmation of this point.

When the block is larger than the inlet to the enclosure, as shown in fig. 3, there may exist a temperature gradient towards the extreme edges of the block during the period of exposure to the fire. For a given rate of heating-up of the block the gradient will depend upon the conductivity of the metal employed for the heat absorbent. It is not a difficult matter to change the direction of this gradient so that any effect resulting from this cause can be controlled.

Normally, these gradients (which are only noticeable as the edge of the block is approached) do not persist for an appreciable period of time after the end of the exposure to the source of heat, and if overlooked would only introduce a small constant error into the results. The greater the overlap of the block beyond the sides of the orifice, the more pronounced are the effects of the gradients which produce an abnormal rate of fall of the temperature of the thermometer in the early stages of the final cooling period. A uniform rate of cooling during the final period, such as can be obtained with the apparatus, is an indication that the gradients are negligible.

The Cooling Correction.

A number of experiments have been carried out to examine the accuracy of the cooling correction. In some the period of exposure of the block to a given source of radiation has been varied; in others the observations have been carried out over different ranges of temperature. The first series (Table VII.) refer to experiments with a copper block about ¾-inch thick, suspended in front of a fire, but unshielded by any guard. The accuracy is less than that obtainable with the later apparatus, in which a guard was adopted, but is still good. Even with this simple apparatus, more reliable results can be obtained than with the R.H.S. radiometer.

Table VII.—*Unshielded Copper Block.*

Period of Exposure. Minutes.	Range of Experiments. ° C.	Corrected Net Rise. ° C.	Centre Reading K.C.U. Per Hour.
5	17·6 to 22·3	4·45	59·3
5	22·3 ,, 36·5	4·38	58·4
5	26·2 ,, 29 8	4·44	59·2
5	29·2 ,, 32·7	4·42	58·9
5	31·8 ,, 35·0	4·39	58·5
7	34·16 ,, 37·88	6·13	58·4
5	36·26 ,, 38·66	4·37	58·3

The seven sets of observations followed one another continuously.

A comparison of the results obtained for the centre reading (*a*) when the block is exposed to the fire for six minutes, and (*b*) when it is exposed to the fire for twelve minutes constitutes a critical test of the method of calculating the cooling correction. This test has been carried out several times, both with an unshielded metal block and with the apparatus in its finished form; and the concordance of the results obtained in all cases was satisfactory. With the apparatus as shown in fig. 3, the following results were obtained:

TABLE VIII.

Period of Exposure.	Range of Experiment.	Net Rise ° C.	Net Gas Consumed. Cubic Feet per Hour.	Net Calorific Value.	Temperature Rise ÷ K.C.U. Available.
(*a*) 6 min.	20·30 to 24·68	6·297	34·38	151·3	0·1212
(*b*) 12 min.	17·40 ,, 27·14	12·620	34·57	151·3	0·1207

In (*a*) the observed rise was	5·630° C.	
,, ,, cooling correction	0·667° C.	
Initial cooling rate	0 029° C.	per half-minute
End cooling rate	0 083° C.	,, ,,
In (*b*) the observed rise was	11·094° C.	
,, ,, cooling correction	1·526° C.	
Initial cooling rate	0 012° C.	per half-minute
End cooling rate	0·110° C.	,, ,,

The difference between the results of the two sets of determinations is equivalent to a variation of ± 0·2 per cent. from the mean. This represents the limit of accuracy of the combination radiometer, meter, &c., and indicates that the computation of the cooling correction is satisfactory.

THE ENCLOSURE.

A steady stream of water is run through the outer chamber, and it is found that, under these conditions, the temperature remains very constant. Tests in this connection have indicated that a marked change in the rate of flow of water through the enclosure does not detrimentally affect the results, as is shown by the following observations.

TABLE IX.—*Effect of Variation in the Flow of Water through the Enclosure.*

Net Temperature Rise ° C.	K.C.U. Available per Hour.	Temperature Rise. ÷ K.C.U. Available.	Calculated Centre Reading for Hourly Consumption of 35 × 150 K.C.U.	Remarks.
6·231	5307	0·1174	105·7	(A) Constant water flow 1740 gms. in two minutes.
6·220	5304	0·1173	105·6	(B) Water flow 1783 gms. in two mins. for first half of expt.; 245 gms. in two mins. for second half.
6·264	5326	0·1176	105·9	(C) Constant water flow 244 gms. in two minutes.
			Mean 105·7	

The water was supplied from a constant-level tank—the rate of flow being adjusted by the control tap at the inlet to the water jacket.

TEMPERATURE OF THE WATER FLOWING THROUGH THE ENCLOSURE DURING THE ABOVE EXPERIMENTS.

(A) *Steady Rate of Water Flow.*

—	Start.	After 8 Minutes.	End.
Inlet temperature, ° C.	12·76	12·77	12·74
Outlet ,, ° C.	13·61	13·62	13·62
Mean temperature, ° C.	13·18	13·20	13·18

(B) *Variable Rate of Water Flow. Cut Down after 8 Minutes from about 12 Gallons per Hour to about 1½ Gallons per Hour.*

Inlet temperature, ° C.	12·70	12·66	13·28
Outlet ,, ° C.	13·60	13·67	13·90
Mean temperature, ° C.	13·15	13·16	13·59

(C) *Slow Rate of Water Flow.*

Inlet temperature, ° C.	13·36	13·52	13 63
Outlet ,, ° C.	15·12	15·21	15·44
Mean temperature, ° C.	14·24	14·36	14·54

The variation in the rate of flow brought about in (B) is abnormal, and is such as would not be likely to occur under any ordinary conditions. With the supply coming from a constant-level tank the variations in the rate of flow are negligible. The amount of water passing through the instrument can be increased considerably beyond that in (A) in the table. The temperature readings given above represent single observations in each case. The constancy of the temperature of the enclosure is very satisfactory with the largest rate of flow. It is interesting to note that the gradual rise in temperature which occurred during (B) and (C) did not affect the result obtained. Experiment (C) would appear to have been carried out before the water enclosure temperature had obtained a steady state.

CONSTANCY OF RESULTS OBTAINABLE.

For the purpose of illustrating the general concordance obtainable under the detailed test conditions with this radiometer the results in Table X. are given.

TABLE X.

Date.	Net Rise. ° C.	Calorific Value Net K.C.U. per Cub. Ft.	Net Gas. Consumption Cub. Ft. per Hour.	K.C.U. available per Hour.	Temperature Rise ÷ K.C.U. Available.	Calculated Centre Reading for Hourly Consumption of 35 × 150 K.C.U.	Remarks.
Dec. 10	6·504	154·8	35·69	5524	0·1177	106·0	
	6·504	154·8	35·54	5500	0·1182	106·4	
16	6·447	153·9	35·35	5440	0·1185	106·7	Bottom of bulb immersed 1½ inches. Bulb 1⅜ inches long.
	6·382	153·9	35·10	5401	0·1181	106·4	Bottom of bulb immersed 3⅛ inches.
17	6·231	152·6	34·69	5307	0·1174	105·7	*Vide* Table IX.
	6·220	152·6	34·76	5304	0·1173	105·6	
	6·264	152·6	34·91	5326	0·1176	105·9	
					Mean	106·1	

The three series of experiments given in the table above were made with the one fire, primarily to test the effect of the variation of certain factors on the results obtained. They have been grouped together as they demonstrate satisfactorily the degree of concordance obtainable from day to day in the determination of the heat radiated on to a given area in front of the fire in terms of total heat available from the gas burnt. Considering each day's test separately, it will be noticed that the maximum variation on any one day was 0·4 K.C.U. (0·38 per cent.), with a variation from the mean of ± 0·2 K.C.U. (0·19 per cent.). This error includes the actual error in the radiometer determinations, in the determination of the gas consumption* and that due to the assumption that the calorific value was constant.† The greatest divergence from the arithmetical mean of any of the seven results is 0·6 K.C.U. (0·57 per cent.)—a divergence probably in part due to the fact that there was a marked variation in the total K.C.U. burnt by the fire on the three days.

These results justify the conclusion that the use of this radiometer enables a more accurate determination of the efficiency of a gas-fire to be made than is possible with the R.H.S. instrument, and that by its adoption the error of the determination is no longer decided mainly by the radiometer, but rather by the other appliances the use of which the experiment involves.

ABBREVIATED METHOD OF TEST.

When there is no appreciable lag—*i.e.*, with a suitably shaped block of a good conducting material—an approximation to the true result, satisfactory for ordinary works purposes, can be obtained by the observation of only four temperatures.

(*a*) The temperature at the beginning of the first period.
Five minutes later, (*b*) the temperature just as the shield is removed.
Six minutes later, (*c*) the temperature when the screen is replaced.
Five minutes later, (*d*) the temperature at the end of the final cooling period.

Then the corrected temperature rise $= (c - b) + 6\left(\frac{c - d}{10} + \frac{a - b}{10}\right)$

This represents the most simplified and least accurate method of carrying out the estimation, and should yield results concordant to within 1 per cent. (*vide* appendix.)

According to the requirements of the test the number of temperature observations can be increased at the will of the operator, and in this way greater accuracy in the computation of the cooling correction obtained, up to the limit previously indicated.

The detailed determination involves half-minute observations over a period of about 17 minutes, and ensures a complete fire test by the Leeds method being made in about 50 minutes; so that, with proper attention to details, it ought to be possible, if

* Any small fluctuations in the gas consumption will not immediately affect to the full extent the heat radiated by the fire, although in the calculation of the true gas consumption from the mean of several observations it is assumed that they do. Any error on this account is decreased by increasing the frequency of the observations, or by carefully noting the total gas burnt during the complete centre radiation determination. The latter method is the simplest and at the same time the most satisfactory.

† Two determinations of the calorific value were made in connection with each radiation determination, and in all the above cases on the same day the mean of each pair of results was sufficiently concordant to justify the assumption of a constant calorific value.

required, to complete nine tests in a nine-hour day, instead of the two tests carried out with difficulty with the original apparatus.

The arithmetical calculation of the result may at first sight appear lengthy; but after a little experience it will be found that, by the aid of a slide rule, it can be done quite easily. Generally it is only necessary to calculate the actual cooling correction for alternate temperature observations during the heating-up and final periods, be these taken at half-minute or minute intervals, as intermediate values can be obtained readily by inspection.

The apparatus is simple and inexpensive, and it ought to be possible with it for any gas undertaking to carry out accurate tests easily in their own laboratories. It will be seen from a consideration of the diagram, fig. 3, which demonstrates the principle of the appliance, that there is very little danger of the instrument getting out of order. The only fragile part is the thermometer, which, in case of breakage, can be replaced at the cost of a few shillings from any dealer in chemical apparatus.

Details of Metal Block Used.

The series of experiments given in Tables VIII., IX., and X. were carried out, as mentioned, in the water jacketed form of the apparatus. The block used was of brass, about ¾-inch thick; this size being suitable for the larger type of gas-fires.

We were led to adopt brass in the preliminary work on account of its low cost, and also owing to the fact that it is easy to cast and obtain sound castings. The preparation of blocks of this alloy is simplified owing to the specific heats of the various ranges of brass being practically the same. That this is so is understood when we bear in mind that—according to Naccari—the specific heat of copper at 20° C. equals 0·0925, and the specific heat of zinc at 20° C. equals 0·0916. Further, both these metals obey Kopp's law very well.

In the calculations we have adopted the figure 0·092 for the specific heat of brass.

Voigt obtained specific heat 0·0917.	Range 20° to 100° C.		
Jaeger and Diesselhorst obtained Specific heat 0·0937 at 100° C. 0·0913 at 18° C.	for brass of the composition	85·7 Cu.	6·4 Sn.
		7·2 Zn.	0·6 Ni.

Accepting Naccari's figures for copper and zinc, and assuming Kopp's law, we calculate the following specific heats for brass at 20° C.

	Composition. Cu.	Zn.	Specific Heat.
Munz metal	60	40	0·0921
Tombac or red brass	90	10	0·0924
Ordinary brass*	70·30 Cu. 29·30 Zn. 0·17 Sn. 0·28 Pb.		0·0921
Naval brass	62 Cu. 37 Zn. 1 Sn.		0·0918

* Typical brass, Clowes and Colman, "Quantitative Analysis," p. 493.

Thus it will be sufficiently accurate to take the figure 0·092 as the specific heat for the various ranges of brass, adopting a yellow brass of approximate composition 70/30 as a convenient standard. The error introduced owing to variations in the composition of such a brass is negligible.

It may be desirable to supply each instrument with two metal blocks, the thinner one for use when testing small fires. Our experience is that a rate of rise of temperature of 1° C. per minute, or thereabouts is very convenient. Theoretically, the use of copper would be better than brass, on the ground that the thermal conductivity of copper is approximately 0·9, as against 0·26 for brass. Experiments are at present in progress to determine whether the use of copper blocks would justify the somewhat increased cost which would be involved in obtaining sound metal. In the case of copper, the temperature gradients throughout the mass would be reduced almost to the minimum, and its use might enable the accuracy of the abbreviated method of testing to be increased.

Résumé of Parts I. and II.

1.—The thermal insulation of the R.H.S. radiometer is not sufficient to enable it to be used for determining the efficiency of the larger gas-fires by the Leeds method.

2.—When additional thermal protection is provided, the existing draught screen interferes with the result.

3.—It is essential that a cooling correction be made with the R.H.S. radiometer, as the rate of heat loss when the temperature of the receptive surface is but little above that of the room is appreciable.

4.—It appears to be most satisfactory to work with the mean temperature of the water passing through the tubes the same as, or very nearly equal to, that of the experimental room, and to apply a cooling correction calculated, on the basis of Newton's law, from the observed heat absorption when the tubes are shielded from direct radiation from the fire under examination.

5.—The results obtained with this instrument are probably only of value for comparative purposes, and do not enable absolute efficiencies to be determined. Further, it is desirable to use it only for comparing fires with approximately the same heating surface.

6.—The heat radiated from a fire can be determined more satisfactorily by the Leeds method when there is adopted a radiometer composed of a block of metal of known mass and specific heat supported in an enclosure at a constant temperature. The rate of rise of temperature of the block when exposed to the fire is noted, together with the rates of cooling before and after the exposure.

7.—By taking half-minute observations over a period of 17 minutes, it is possible to obtain results varying from the mean by ± 0·2 per cent. When only four temperature observations are made, the results are concordant to within 1 per cent.

Since the completion of the above work, our attention has been drawn to the work of Pouillet and Violle on solar radiation. The former employed a shallow silver vessel containing water, the rate of rise of temperature of which was determined when exposed to the sun's rays. He endeavoured to compensate for lag by rotating his apparatus rapidly, and thus stirring up the water mass. His work has been criticized on the score of lag. To improve on this, Violle devised an apparatus on similar lines. A thermometer with a blackened bulb supported in a suitable enclosure was exposed to the sun, and from the temperature rise, when a steady state was attained, the heat absorbed was determined. The apparatus designed by us appears to combine some of the advantages desired by both Pouillet and Violle.*

Schuster and Lees, in their "Exercises in Practical Physics" (Second Edition, pp. 126, *et seq.*) discuss at some length this well-known method of calculating the cooling correction in calorimetric determinations. In connection with it, they say (p. 130): "In an accurate determination . . we are able to measure a rise in temperature of a few degrees to about one part in a thousand, although the observations have only been taken to a hundredth part of a degree. The increased accuracy is obtained by making use in the initial and final stages of a number of observations, and taking the mean."

With regard to the discarding of unnecessary decimals, the last remaining figure is increased by one when the first discarded figure is greater than 5, or is a 5 followed by other figures. When, however, there is only one figure to be rejected and that is 5, a systematic error would be introduced in the above tables if uniformly we allowed either the last figure to stand or increased it by one. In connection with this point Schuster and Lees say (p. 131): "An excellent rule adopted in the United States, and deserving to come into general use, is always to leave the last figure an *even* number. Thus 2·535 and 3·065 should be shortened to 2·54 and 3·06."

* "Comptes Rendus," Vols. 78, 79, and 82.

Appendix.

[Date, Sept. 4, 1914. Fire, 16-inch "Flambeau."]

Initial Cooling Period.					Final Cooling Period.	
Time. Minutes.	Temperature.	Time. Minutes.	Temperature.	Cooling in Three Minutes.	Temperatures.	Cooling in Three Minutes.
	°C.		°C.	°C.	°C. — °C.	°C.
0	24·82	3	24·70	0·12	31·18 — 30·75	0·43
½	24·80	3½	24·69	0·11	31·10 — 30·70	0·40
1	24·78	4	24·65	0·13	31·02 — 30·62	0·40
1½	24·75	4½	24·63	0·12	30·97 — 30·54	0·43
2	24·73	5	24·61	0·12	30·90 — 30·47	0·43
Mean	24·776	—	24·656	0·12	31·034 — 30·616	0·42 Mean

Average initial temperature . . . . . 24·716° C.
Initial cooling rate . . . . . 0·020° C. per half-minute.
Temperature at end of 5½ minutes when screen removed . = 24·716° C.
0·120
24·596° C.

Average final temperature = 30·825° C.
Final cooling rate . . . = 0·070° C. per half-minute.
Difference between average final and initial temperatures:
30·825 — 24·716 = 6·11° C.
Change in cooling rate over this range = 0·050° C. per half-minute.

Time. Minutes.	Temperature.	Average Temperature of Interval.	Cooling During Interval.	Total Cooling.	Corrected End Temp.
	°C.	°C			
6	25·17	24·88	0·020 + 0 001		
½	25·73	25·45	,, + 0·006		
7	26·29	26·01	,, + 0·011		
½	26·86	26·58	,, + 0·015		
8	27·44	27·15	,, + 0·020		
½	28·00	27·72	,, + 0·024		
9	28·56	28·28	,, + 0·029		
½	29 10	28·83	,, + 0·034		
10	29·62	29·36	,, + 0·038		
½	30·17	29·90	,, + 0·042		
11	30·70	30 44	,, + 0·047		
½	31·23	30·96	,, + 0·051		
Screen Replaced.					
12	31.18	31.20	,, + 0·053		
½	31·10	31·14	,, + 0·052	0·703	31 80
13	31·02	31·06	,, + 0·052	0·775	31·80
½	30·97	31·00	,, + 0·051	0·846	31·82
14	30·90	30·94	,, + 0·051	0·917	31·82
½	30·82	30·86	,, + 0·050	0·987	31·81
15	30·75	30·78	,, + 0·050	1·057	31·81
½	30·70	30·72	,, + 0·049	1·126	31·83
16	30·62	30 66	,, + 0·049	1·195	31·82
½	30·54	30·58	,, + 0·048	1 263	31·80
17	30·47	30·50	,, + 0·047	1·330	31·80

Mean corrected end temperature = 31·811 °C.
Temperature when screen removed = 24·596
Corrected rise = 7·215 °C.

Gas consumption at 0° C. and 760 mm. = 9·525 cub.ft. in 18 min.
= 31·75 cub. ft. per hour.

Specific heat of brass . . . . . = 0·092 cals. per ° C.
Mass of brass block . . . . . = 4630 grammes.
Water equivalent of block . . . . = 425·96 grammes.
Water equivalent of mercury and thermometer bulb . . . . . = 35 × 0·033 + 0·46 = 1·62 grammes.
Total water equivalent of heat absorbed . . . . . = 427·6 grammes.
Heat absorbed per hour under the condition of test.
H = 7·215 × 10 × 427·6 cals. = 30·85 K.C.U.
Area of orifice in radiometer . . . = 36 square inches.
Required centre reading

$$H_C = H \times \frac{144}{36} = 123{\cdot}4 \text{ K.C.U. per hour.}$$

APPROXIMATE DETERMINATION OF CENTRE READING, *vide* p. 797.

$$\text{Net rise} = (c - b) + 6\left(\frac{c - d}{10} + \frac{a - b}{10}\right)$$

In the above case $(a) = 24{\cdot}80$
$(b) = 24{\cdot}60$
$(c) = 31{\cdot}23$
$(d) = 30{\cdot}54$

$$\therefore \text{Net rise} = \left(31{\cdot}23 - 24{\cdot}60\right) + 6\left(\frac{31{\cdot}23 - 30{\cdot}54}{10} + \frac{24{\cdot}80 - 24{\cdot}60}{10}\right)$$
$$= 6{\cdot}63 + 6\,(\cdot069 + \cdot020)$$
$$= 6{\cdot}63 + \cdot534$$
$$= 7{\cdot}164° \text{ C.}$$

$$\therefore \text{Centre reading} = 7{\cdot}164 \times 427{\cdot}6 \times \frac{144}{36} \times 10 \text{ cals. per hour.}$$
$$= 122{\cdot}5 \text{ K.C.U. per hour.}$$

This result is 0·9 K.C.U. per hour less (0·7 per cent.) than that obtained by the preceding method.

THE BECKTON TOLUENE RECOVERY PLANT.

THE demand for toluene for explosive purposes found the staff of the Gas Light and Coke Company at Beckton fully prepared to set aside a portion of the plant to toluene extraction, with the result that for some time past 15 million cubic feet of gas have been treated daily—a quantity which will shortly be increased to 20 millions.

Research and large-scale experimental work carried out during the last two years provided information as to the most suitable wash-oil; and the quantity of oil required to extract a maximum quantity of toluol without materially reducing the illuminating power or calorific value of the gas.

By using a limited amount of oil in the washers, very little benzene is extracted from the gas—giving an effect similar to using a larger proportion of oil and adding benzene to it, as has been suggested by several other investigators on this subject.

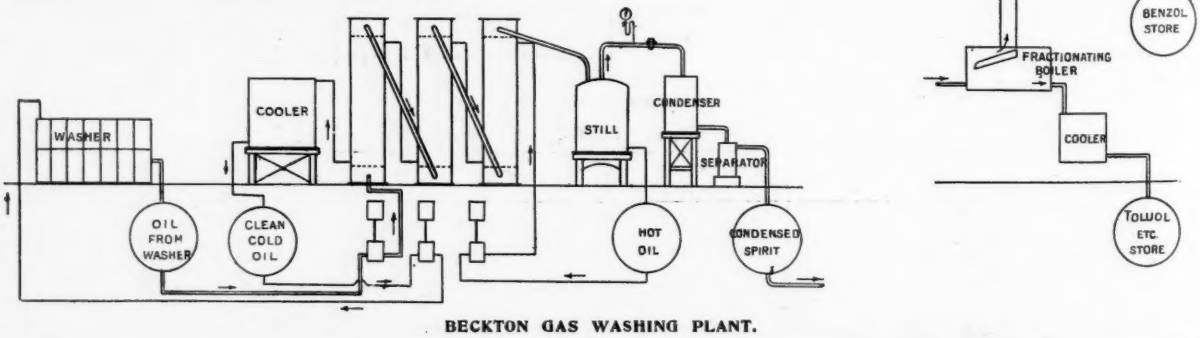
A crude spirit is obtained, rich in toluol, xylol, naphthalene, &c. By this means, only a small quantity of benzol has to be returned to the gas, and the plant for dealing with the saturated oil is small compared with that required when more wash-oil is used, and a greater proportion of the benzol is removed.

Rotary and centrifugal washers are used for the absorption of the toluol by the wash-oil.

The method of working (as shown by the accompanying sketch) is as follows: The cooled debenzolized oil is pumped from the cold-oil store-tank at a constant rate through the washer, where it meets an opposing stream of gas. From the washer, the oil, now containing the toluol, &c., runs into a store-tank, from which it is pumped through the counter-current heat economizers to the still, in which the wash-oil and the light spirit are separated by means of steam.

This method of separation is not unduly expensive in steam, provided the wash-oil in the extraction washer is not used excessively. But as a more economical arrangement, it is proposed to make a trial of a direct-heated coil; an expansion chamber being worked on the outlet.

The hot wash-oil from the still flows to a collecting tank, from which it is pumped through the heat exchangers, and onwards through water coolers, after which it flows to the store-tank, from which the extraction washer is fed. The light spirit vapours, after leaving the still, are conducted through a condenser; the condensed mixture of benzol and toluol flowing to a collecting tank after the separation of the condensed water. The mixture of spirit is afterwards rectified in a fractionating boiler, where the lighter spirit is separated from the toluol, xylol, &c., before this heavier boiling portion is sent to the products works for rectification—a yield of about one-third of a gallon of pure toluene per ton of coal carbonized being obtained.



BECKTON GAS WASHING PLANT.

Lectures on Illuminating Engineering.—A special course of nine lectures on "Illuminating Engineering," at the Birmingham Municipal Technical School, has proved very successful. A popular fee was fixed; and the subjects have been illustrated by lantern slides and demonstrations. Mr. W. G. S. Cranmer and Mr. R. J. Rogers have ably presented the case for gas lighting; and Mr. J. H. Asdell, M.Sc., has done the same for electricity.

Manchester District Junior Gas Association.—The sixteenth annual meeting will be held on Saturday of next week (the 10th prox.) at the Grosvenor Hotel, Manchester, to be followed by a social evening. After the presentation of the annual report, there will be the election of Vice-President and Officers for the 1915-16 session. This will be succeeded by the Presidential Address of Mr. S. Carter, of Garston.

BRITISH COMMERCIAL GAS ASSOCIATION.

Report of the Executive Committee.

At the Meeting last Tuesday of the General Committee of the British Commercial Gas Association, the Executive Committee submitted the following report, covering the period since the general meeting held on Oct. 27 last.

I.—Finance. A Growing Subscription List.

The decision approved by the general meeting, to proceed with the full publicity campaign during the current year, so as to assist the industry as far as possible to maintain its business during the crisis with which the nation is faced, has received the practical support of the industry in a measure that has exceeded all expectation.

Not only have the subscribing gas undertakings, with but few exceptions, renewed their contributions on the same basis as in former years, but some that previously had subscribed on a partial basis have this year given the full 2s. 6d. per million—notably Leicester, where last year's subscription of £150 has been followed this year by £285—while the number of new subscribers to be reported is, in all the circumstances, most gratifying.

It has thus been shown conclusively that the great bulk of the administrators of undertakings which represent 80 per cent. of the industry realize fully the importance of maintaining the national publicity campaign during a period of exceptional difficulty, and believe that, whatever other economies have to be effected, expenditure on development should be maintained and, if anything, increased.

The total subscriptions actually received from undertakings since the 1st of October amount to £10,178; and we have definite assurance of a further £2764, apart from undertakings, representing a subscription of £2250, to whom application has only quite recently been made.

In addition, there will be the subscription from the Society of British Gas Industries, the Council of which are doing all they can to ensure an increase over the previous year.

There is therefore every reason to anticipate that the income for the current financial year will be at least as great as during the previous year, and to hope that it will be actually considerably greater.

II.—Question of Non-Subscribers.

This circumstance, highly satisfactory as it is, does not do away with the unsatisfactory fact that there are still so many undertakings benefiting by the expenditure of their neighbours without contributing anything to the common fund. Much has been done by correspondence to bring the case for universal membership before all non-subscribing undertakings, and results are steadily accruing from this campaign and from the efforts of individual members. It has, however, been suggested by several members that more could be done by organized personal effort in the various districts; and the Executive recommend:

(*a*) That a Membership Committee should be formed in each district, to take such steps as they may deem practicable and advisable for bringing the claims of the Association before those undertakings in the district which have not yet joined their neighbours in supporting the national campaign;

(*b*) That for this purpose the existing District Conference Committee in each district (which comprises the Vice-Presidents connected with undertakings in the district, the members of the General Committee representing the district, the President and Secretary of the District Institution or Association, the Chairman and Secretary of the District Commercial Section, and the General Secretary of the Association) should form a nucleus of the District Membership Committee, with power to add to its numbers;

(*c*) That in any action taken by the District Membership Committees, care should be taken to secure the sympathy and co-operation of the officers of the undertakings which it is desired to approach;

(*d*) That each District Membership Committee should appoint a Chairman and an Honorary Secretary, who should, with the General Secretary, constitute a Membership Committee for the whole country, who would meet for the purpose of exchanging experiences and co-ordinating their efforts, and would report annually to the conference on the work of all the Committees.

III.—Question of District Conferences in 1915.

Inquiries in all districts have made it clear that it is the very general opinion of members that the present time is not opportune for the holding of District Conferences, even in a modified form; and the Executive accordingly recommend that no steps be taken in this direction during the current year.

IV.—Date for Closing the Financial Year.

With a view to making it possible to submit the draft annual report and accounts to the General Committee, and subsequently to issue the approved report and accounts to the members before the general meetings in October, the Executive recommend: "That the accounts for the current and each succeeding financial year be made up to the 31st of August, instead of the 30th of September."

V.—Constitution of the Executive Committee.

In view of the increasing number of subscribers, and for the purpose of ensuring adequate representation of the various districts on the Executive Committee, in proportion to the income received from each district, the Executive recommend that the following proposal be submitted to the members at the next annual general meeting.

That Rule 10 be altered so as to read: 10(*a*). The Executive Committee shall . . . . consist of 21 members made up as follows: (1) The President and First Vice-President (*ex officio*) and eighteen members to be elected by the General Committee from among the members of that Committee, but so that four of them shall be members of the Institution of Gas Engineers and three of them shall be members of the Society of British Gas Industries; and (2) Honorary Treasurer, *ex officio*.

In electing the eighteen members aforesaid, the General Committee shall have regard to the total subscriptions received from each district. (*b*) A Chairman and Vice-Chairman shall be appointed from time to time by the members of the Executive Committee from among themselves, and shall retire at the meeting next following the annual general meeting, and shall be eligible for re-election. At the first meeting of the General Committee after each annual general meeting six members of the Executive Committee shall retire and shall be eligible for re-election . . .

VI.—Government Aid to Statutory Gas Undertakings.

Representatives of the Association attended a meeting on Jan. 12 of a Joint Committee composed of members of the Institution of Gas Engineers, the Society of British Gas Industries, and of the Association, to consider the question raised by Mr. Brearley and others as to whether Governmental aid could be obtained for gas undertakings in need of additional capital. After a full discussion, the President of the Institution was asked to approach the Board of Trade on the subject, without making any definite appeal for such assistance. He has since done so, and has ascertained that there is no prospect of any such assistance being afforded.

VII.—Claims of Operative Plumbers to a Monopoly of Wiped-Joint Work.

The Executive recently had under consideration a letter from Mr. S. R. Barrett, of Birmingham, concerning the claim submitted to the Birmingham Architectural Association by the Operative Plumbers that gas-fitters should not be allowed to do any work in connection with hot-water supplies, and communications on the subject from the National Association of Master Heating and Domestic Engineers. From the latter, it appeared that the Master Heating Engineers were opposed to the claim of the Operative Plumbers to a monopoly of water-pipe work; that they had contested the claim before Sir George Askwith at a conference held in Edinburgh in November, 1913, which proved abortive; and that Sir George Askwith had made several efforts to arrange a joint conference, but the Operative Plumbers refused to join in.

After careful consideration and full discussion, it was resolved as follows:—

(1) That a letter be sent to the Birmingham Architectural Association informing them

(*a*) That the gas industry are directly and increasingly interested in the matter of the line of demarcation between the work of plumbers and gas-fitters owing to the rapid growth in popularity of gas-heated hot-water appliances;

(*b*) That the claim of plumbers to a monopoly of all water-pipe work, even to the making of such "wiped" joints as may be necessary for the connection of a gas-heated appliance to the water-pipes is, in the opinion of this Association, contrary to reasonable practice, and would involve the public in much unnecessary expense or hinder business through making the cost of installing gas appliances prohibitive;

(*c*) That the award of the Board of Trade Arbitrator at Leicester in November, 1909, which gave "all lead work in connection with hot and cold water domestic (or other) supplies or services" to the plumbers, is not satisfactory, because, in the opinion of this Association, it is essential to the practical and economical execution of the work of fitting up gas apparatus that a gas-fitter should be allowed to complete the job, so as to leave it in proper working order, without calling in another tradesman to make a joint. But

(*d*) That the gas industry has no desire to take out of the hands either of the plumbers or of heating and domestic engineers the work of installing baths, runs of water or waste pipes, or other portions of installations which are not directly essential to the fitting-up of gas appliances.

(2) That a similar communication be sent to the National Association of Master Heating and Domestic Engineers, with an intimation that the Association would be glad to co-operate with them in combating the claims of the plumbers should a suitable occasion arise.

(3) That the Association fully endorses and adopts the opinion expressed by Mr. Edward Allen at Liverpool in June, 1914, to the effect that every gas-fitter should be qualified to complete his own job; that this includes the making of a wiped joint; that gas managers do not wish to interfere with plumbing work properly so called, but will not undertake the work of putting in a gas-pipe and then sending for a plumber to make a wiped joint.

(4) That the Association is of opinion that the education of a gas-fitter is incomplete if he is unable to make a wiped joint, but that the ability to make such a joint does not constitute him a qualified plumber entitled to plumbers' rate of wages.

(5) That for the purposes of record, inquiries be made of all municipal subscribing undertakings as to whether any, and, if so,

what, rules or practice obtain in their districts as to the differentiation of gas-fitters' from plumbers' work.

VIII.—Assistance Rendered to Subscribers.

The Executive receive each month lists [a summary of which is given in an appendix to the report] indicating the many services which the Association is able to render from headquarters to subscribing undertakings in connection with local publicity work, controversies, and problems.

Particulars of some of these cases are published from time to time in the "Bulletin;" and the Executive note with much satisfaction the steadily growing use made of the Association as a bureau of information and advice. They also desire to record their appreciation of the readiness and generosity with which members possessed of information required by others place that information at the disposal of the officers.

THE STATE OF EMPLOYMENT.

The preliminary results of an inquiry into the state of employment during the month of February of this year, as compared with conditions which were existing before the war, were issued a few days ago, in the form of a report to the Board of Trade by Mr. H. Llewellyn Smith; and figures given show the remarkable nature of the changes that have taken place in the intervening period. The report is based mainly on returns received from 24,000 industrial firms, employing over 4,000,000 workpeople, which is computed to be about 46 per cent. of the persons employed in private industrial concerns.

Taking first of all December, the reduction in the number of male workpeople in industrial employment, as compared with July, was 10·9 per cent.; while the percentage joining the forces up to that date was 13·3. This shows that there had, at that time, been an absorption into industry of men and boys unemployed or unoccupied in July amounting to 2·4 per cent. But, passing on to February, it is seen that by then the percentage joining the forces had gone up to 15·4; while the reduction in the number of male workpeople had risen only to 11·8 per cent. So that the percentage of absorption into industry of unemployed or unoccupied males had increased to 3·6. It is pointed out in the report that the percentages given as joining the forces do not by any means represent the number of recruits enlisted, but relate solely to men known by their employers to have left industrial employment for the purpose of joining the forces. They do not, therefore, include any recruits who enlisted while unemployed, or whose occupation was not industrial. On the other hand, however, they include reservists besides new recruits.

It is computed that the number of persons who have found employment in industrial occupations, who were not so occupied before the war, is about 250,000; and these have been drawn from many sources—the continuous employment of casuals, the absorption of workpeople who were unemployed or on strike in July, the re-engagement of elderly persons who had left industry, and, of course, the taking-on of boys. The metal, engineering, and shipbuilding trades show in a marked degree all the evidences of increased pressure—less short time, more overtime, and in most cases an increase in the actual numbers employed. It is stated that the home and export trades in finished iron and steel products are very brisk. Large contracts for constructional steel have been placed for the allied Governments; while orders are coming forward more freely from neutral countries. As regards the shipbuilding and engineering trades, workpeople have been attracted from various sources; but in spite of overtime and some increase in the numbers employed, the demand for labour in all parts of the country is, it seems, still unsatisfied.

The railway companies show a reduction in their regular employees of 9·5 per cent., while 10·5 per cent. have joined the forces or been taken for special railway work abroad. So that companies have filled places to the extent of 1 per cent. of the normal staff. The proportion of enlistment in the case of Government service had risen in February to about 20 per cent.; while temporary assistants have been engaged to the extent of about four-fifths of the number who had gone. The report says that in gas, water, and electric lighting undertakings under local authorities, the number of manual workers now employed is actually larger than in July, in spite of the enlistment of about 4000 men (14·1 per cent.) out of 28,500 for whom returns were received. According to the census of 1911, the number of males estimated to have been employed in gas, water, and electricity works last July was 75,000; and of these 0·4 per cent. were calculated to have been working short time, and 6·7 per cent. working overtime, in February. The contraction of numbers employed since the war broke out has been 3·5 per cent.; while the proportion known to have joined the forces is 14·8 per cent. Thus there has been apparently a replacement of those who have gone to the extent of 11·3 per cent. In commercial occupations, the proportion who have enlisted is still well in excess of the average in the country as a whole.

We are asked by Mrs. Fergusson and her son—writing from the Gas-Works House, Barrow-in-Furness—to thank numerous friends for their kind expressions of sympathy and floral tributes in their recent bereavement.

THE VALUE OF COKE BREEZE AS A BOILER FUEL.

[From a Correspondent.]

In the "Journal" for March 16, p. 685, some particulars were given of the use of coke breeze in electric generating stations. The prices named, 6s. and 8s. per ton for coke breeze, seem to indicate that some makers of this excellent boiler fuel are willing to sell it at a figure which does not nearly represent its fuel value, at any rate at the present time. This is especially to be deplored if —as appears to be the case—it is being sold for use in electric generating stations, which are thereby enabled to maintain their generating costs at a normal figure just at the very time when gas has to be increased in price as a result of the high price of coal and freightage. High coal costs affect the electric light works equally as much as the gas-works; and the rise in fuel prices must surely cause corresponding increases in the price at which gas and electricity can be sold to the public. But not so if gas companies are going to sell their competitors fuel at absurdly low prices. That coke breeze should be sold at 8s. a ton, when the corresponding price of coke is 25s. to 30s. a ton, and when coal slacks are obtainable at not less than 20s. a ton, based upon London prices, is surely unjustifiable if actual fuel values are taken into account.

Its value as a boiler fuel is quite two-thirds that of coke, and at least three-quarters that of the cheaper coal slacks sold in London. That this is so is shown by Mr. E. W. L. Nicol, in a letter written to the "Electrical Review" [reproduced in the "Journal" on March 16, p. 685], for here he states that, "makers of furnace apparatus will guarantee an evaporation of 6 lbs. of water per pound of breeze." This has been proved by the writer on several occasions on gas-works boilers. It may be interesting to give the details of the last test made with coke breeze, which had passed through a ½-inch round mesh.

24 Hours' Test on Two Lancashire Boilers.

Weight of breeze used.	5 tons 19 cwt.
Water evaporated, in lbs.	74,340
Average steam pressure	98 lbs.
Feed water temperature.	150° Fahr. (average).
Water evaporated per lb. of fuel . . .	5·59 lbs.
do. do. from and at 212° Fahr.	6·15 lbs.

Figures supporting an evaporation of over 6 lbs. have also been given by Mr. Harold Woodall, of Bournemouth, where "Underfeed" stokers are using coke breeze in Stirling boilers.

Accepting this figure as one which should be obtainable in practical working, how can such low sale prices as those mentioned above be justified? Now coke may be expected to yield an evaporation of 9 lbs. of water per pound of coke from and at 212° Fahr. This figure for coke fairly corresponds with that mentioned for coke breeze. On this basis, therefore, the latter should be saleable at two-thirds the prevailing price of coke, which, at London yard rates of 25s. per ton, would make it worth 16s. 8d. per ton at the works. This would, however, be rather too high, for the value of a fuel does not depend solely on evaporative results, but partly on the possible output from a boiler when working on the particular fuel, labour costs per ton, and one or two other minor factors. In the case of coke breeze and other low-grade fuels, the boiler capacity is naturally reduced to some extent as compared with that when a good class of steam coal or coke is being used. In the letter to which reference has already been made, Mr. Nicol states that with coke breeze rates of combustion exceeding 30 lbs. per square foot of grate per hour have been maintained with automatic mechanical stokers of the underfeed travelling grate type. This figure, which, although high, one has no reason to doubt, shows that with a fuel of this class the boiler capacity need not suffer if due regard be paid to the best methods of using it.

Of course, if a boiler has been hand fired to its full capacity on a high quality of steam coal and a change is made to coke breeze, no one must be surprised if the capacity of the boiler is halved, for what are suitable conditions for the former are quite unsuitable for the latter. Such conditions must be taken into account before coming to any hasty conclusion as to the result of a test. This is mentioned for the reason that large buyers of boiler fuel are often extraordinarily ignorant of the proper methods of using the fuel when bought. They appear to think that their particular plant should be equally suitable for using any class of fuel; and should a new fuel not give the desired result on trial, it is immediately condemned with a total lack of intelligence.

In the references made in the "Journal" on the subject of coke breeze for electric generating stations, we have an instance of the right and the wrong method of tackling a problem. Mr. H. W. Bowden, the Chief Engineer of the South Metropolitan Electric Light and Power Company, described, at the meeting of his Company's shareholders, how satisfactorily he had been using coke breeze, but not without first "inspecting several boilers on the Continent burning coke breeze successfully," and then placing suitable apparatus on order. Intelligent investigation of the question is first of all made, and proper apparatus then installed. This is the right method, and what would be expected of an engineer who knows his business.

His remarks were succeeded by those of a shareholder, who had evidently come to a very hasty decision, as he is reported to

have stated that "his experience of using it [coke breeze] and trying to get the same output was that it meant reducing the life of the boiler by one-half." How long did he use it, and was it long enough to warrant him in making such a very sweeping assertion? One might safely hazard the remark that in this case the coke breeze was tested on the wrong method. The point is this: Coke breeze can be used without detriment to the capacity of a boiler if it is used with intelligence; and as to the life of a boiler fired on coke breeze, gas engineers can produce irrefutable evidence on this point.

The cost of labour is, of course, increased where inferior fuel is used; for larger quantities are fired into the boiler, and the fires are cleaned more frequently. But "labour" is a small item compared with "fuel." One stoker is supposed to fire 6 tons of coal into a hand-fired boiler during an average day's work. Assuming that the coal costs £6 in all, it is seen that labour is not likely to cost more than 6s., or 5 per cent. only of the cost of fuel. It is apparent, therefore, that though labour will be a heavier item with inferior fuel than with higher class grades, it cannot appreciably affect the value of a fuel by more than from 5 to 10 per cent.

Thus to revert to the relative values of coke and coke breeze, it was stated above that coke breeze is worth two-thirds as much as coke, based upon the evaporative duty obtainable in a boiler. If, now, we make some allowance for the increased labour and the decreased boiler capacity with coke breeze in use, the two will be placed upon a comparative basis. In some cases these factors would be of no consequence, and in others they would be all-important. But if a deduction of 15 per cent. is made off the calculated value of coke breeze, it might be claimed that this would be a sufficient and fair allowance under average conditions. On this basis, if in normal times coke is worth 18s. a ton for steam-raising, breeze should be worth 12s., less 10 per cent., equal to 10s. 2½d. a ton.

Instead of obtaining a fair price for breeze, gas companies frequently treat it as though it were a fuel of very little value, whereas the results on their own boilers should long since have proved its worth. It can never pay to burn coke on boilers and sell breeze for anything less than a price based upon the above or similar method of calculation. At the present time there can be no reason for selling it at low prices when coal is so scarce and so high-priced; while the policy of selling it at cheap rates to electric light undertakings must surely be most impolitic. Fuel costs in a generating station amount to about 0·30d. to 0·40d. per unit; and with the price of coal increased by (say) 70 per cent. as is the case with seaborne coal, this item is raised by roughly ¼d. per unit, which must again be charged to the public. But if gas companies are to sell them coke breeze at 8s. a ton, not only will the fuel costs not be increased, but they are likely to be decreased as compared with normal times. The electrical engineer must indeed be viewing (and taking advantage of) the situation with his "tongue in his cheek."

INSTITUTION OF WATER ENGINEERS.

Postponement of the Belfast Meeting.

It will probably be remembered that, at the winter meeting of the Institution of Water Engineers in December last Mr. F. W. M'Cullough, M.Inst.C.E., the Water Engineer to the Corporation of Belfast, was elected President for the ensuing year. In acknowledging his election, he offered the members an invitation from the Lord Mayor of Belfast, and the Chairman and members of the Water Trust, to visit the city for the summer meeting in June this year; and he expressed the hope that the war would then be over, or, if not, that it would have sufficiently spent itself to enable the members to cross the Irish Channel in comfort. We learn from the Secretary (Mr. Percy Griffith, M.Inst.C.E.) that, in view of the probability that the attendance at the meeting would be prejudicially affected by the war, the Council have decided to postpone the Belfast engagement until the summer of 1916. A meeting will be held in London on Friday, the 18th of June next, for the purpose of installing the President-Elect and for the reading and discussion of papers—particulars as to which will be announced later. The annual dinner and visits to works will be abandoned this year. It is suggested that Mr. M'Cullough should be nominated for election to the presidency for a second year; and, if re-elected, his address will be delivered at the Belfast meeting in June, 1916.

At the last meeting of the Council, the following gentlemen were unanimously elected honorary members of the Institution: Mr. J. B. Hill, R.N., Geological Adviser, and Mr. H. H. Law, M.Inst.C.E., Chief Engineering Inspector, of the Local Government Board; and Mr. P. C. Cowan, D.Sc., M.Inst.C.E., the Chief Engineering Inspector of the Local Government Board for Ireland. On the same occasion, Mr. W. A. Walker, the Engineer and Manager of the Higham and Hundred of Hoo Water Company, was elected a member, and Mr. G. A. Ballard, the Assistant Borough Engineer of Guildford, an associate member of the Institution.

Messrs. Constable and Co., Limited, send us a copy of "The Gas-Turbine," by Norman Davey. A review of its contents will appear in our columns at an early date. The price of the book is 15s. net.

KILLING THE GOOSE THAT LAYS THE GOLDEN EGGS.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

At a time when many of our relatives and associates are risking their lives in the service of our country, it would ill become any individual or company, however hardly hit by the congestion of the railway traffic, or by the absorption of the whole available labour for national purposes, to make any complaint of a personal nature or to expect sympathy on that score. In the present crisis we must one and all be prepared to make heavy sacrifices to the common cause—some in one way, some in another. One may incidentally mention that the restriction on the delivery of supplies of coal, and enormous demands for labour on the part of Government contractors, following hard upon the loss of a large proportion of employees by enlistment, have done the gas industry in this neighbourhood an injury of unprecedented character, the effects of which will not disappear in our time. These results are not peculiar to ourselves, but affect all other manufacturing industries exactly in the proportion to which they are dependent on unskilled labour, coal supply, and railway traffic. The only grounds on which it is appropriate to approach this subject *in extenso* are the effect on National finance, the carrying out of Government contracts, and the safety or convenience of the public. That the maintenance of an adequate gas supply is largely concerned in these and similar questions is a point that need not be laboured in detail in these columns.

Apparently these matters are more deeply appreciated by the governing powers in other countries than by those of our own. In some parts of the United Kingdom, the military authorities have not only been sympathetic, but have rendered actual assistance in times of stress. In other districts, appeals made for increased railway clearance, or for help in the way of a temporary loan of men in time of emergency, have met with a blunt refusal. Business men in the United States are counting on the fact that the loss of life, and destruction of property in Europe will have the effect of increasing the cost of material and labour and of diminishing output, and in this way bring grist to their mill by enabling them to compete with the belligerent nations in the markets of the world under exceptionally favourable terms. Germany has not lost sight of the point—has she lost sight of any financial or commercial point—and under conditions more onerous than our own is economizing her resources in every possible way. But here in England we get nothing beyond a few spasmodic, temporary, and unsystematic attempts to relieve for the moment any acute position.

The man in the street, with no previous experience of a European war to the death to guide him, could not be expected to foresee matters that must from the first have been perfectly plain to the heads of our military transports and our railways. A timely warning, issued six or seven months ago, would have enabled gas companies to have considered the position, and, if necessary, check their output of gas, and would have had a marked effect on the present position in the coal market and the terms on which contracts will be fixed over the ensuing year. If the Government and railways had wished to play into the hands of the collieries, as against the consumers of coal, they could not possibly have selected a more effective line of action. As it is, many gas undertakings have been unable to maintain their normal supply pressure over the last three months, partly on account of the deficient, uncertain, and irregular supplies of coal, and partly because the public are not slow to appreciate the fact that gas at normal prices is not only a more convenient, but a cheaper fuel than coal at current quotations. In a misguided moment, in view of the increasing difficulty of obtaining coal, a notice was sent round to the consumers in a certain district, requesting them to economize in respect of the consumption of gas. The effect was the reverse of that desired and expected. The consumption of gas went up 10 per cent.; and it turned out that many consumers, scenting a rise in the price of coal, locked up the domestic coal cellar and turned the gas full on at the meter.

One of the chief among the numerous difficulties that gas companies in this district have had to encounter since the declaration of war, is the practice of declaring certain railway stations closed for an indefinite period, so far as particular collieries are concerned. Notice is sent to collieries that coal will not be accepted (say) for Salisbury until further advised. But the party most interested (the Salisbury Gas Company), or other consumer of coal, is not notified, and, unless the colliery happens to explain the position, remains in ignorance, expecting the usual deliveries. In this matter, matters may drift until serious shortage at Salisbury is manifest, and the time for obtaining supplies elsewhere has gone by. The "closing," according to information received, appears to be exercised in an erratic manner, and not extended to all alike, or to be equally divided one with another; so that one gas company, whose contracts happen to be confined to unfortunate pits is in dire distress, while its neighbour is receiving normal supplies from the same district. Even where there is a good reserve stock at the gas-works, the matter is bad enough, because the coal intended for Salisbury, but refused, is not reserved for Salisbury, but immediately disposed of elsewhere in some more fortunate locality, while Salisbury is prejudiced in the matter of obtaining the quantity due under contract in time to be of use. But when, as is no uncommon thing in the South-West of England,

stocks, instead of being counted in months, are reckoned in terms of days or even of hours, there is very great risk indeed of complete collapse.

It has been the practice of gas companies when placing contracts to confine their purchases to bare requirements. If from some cause the coal store has become depleted, they include sufficient margin to allow of the gradual recovery of the stock. If supplies are restricted, by refusal to accept at the dispatching end, or delayed by holding-up in transit for weeks and months—I hold invoices for coal dispatched Jan. 15, and not yet delivered, and if ever it does arrive it will be depreciated quite 10 per cent. in gas and coke making quality—the first thing that happens is the depletion of stock. We often hear about waste of National resources when coal is used extravagantly or recklessly. What about the waste of such resources during the last three months, due to prolonged exposure to weather? If the disturbing cause is not so severe or prolonged as to outset the staying power of the stock in the users' coal-stores, no special effect on the daily operations is evident. But the case is different when, as is the position to-day, the disturbing cause exceeds in these respects the staying power of any reasonable stock. There is no alternative to reduced consumption of coal, to reduced pressure at the governors, and to reduced consumption of gas, unless the undertaking happens to have some reserve in the form of a carburetted water-gas plant. Some have not this auxiliary in any form, and few provide a plant of excess capacity to normal requirements. In passing, one may remark on the curious anomaly of being able to obtain oil from another Continent with greater facility than coal from collieries 30 miles distant. Regular supplies of oil up to the present time have, in many instances, been the means of saving the position.

Much has been made of the assistance to be derived from income-tax towards meeting the enormous expenditure required by the war. In regard to income-tax, it is made up of a large number of individual units (perhaps a few millions). It comprises two prime factors—the assessment and the sum assessed. The first must necessarily, if the usual conditions of life are to be maintained, be comparatively low. Anything over 15 per cent. would be a serious public hardship. When expenditure increases, there are two ways of meeting the additional demand—an increased assessment, and an increased amount to be assessed upon; or if it cannot be increased, there is the more necessity for every care and precaution that it does not diminish. Out of two or three millions it does not matter much if a few small fry make no profits, or only half profits. But when a class that make up more than one-fiftieth of the whole is restricted, the result is not negligible. The effects of restricted capital issues, restricted coal supply, depreciation of coal by prolonged transit, and increased cost of labour, will adversely affect the profits of 1915, compared with those for 1913 or 1914; and, as already remarked, causes that restrict the profits of gas undertakings will also affect those in other lines of manufacturing industry. The increased rates of pay for labour, if not attended with a proportionate increase of output, mean the transference of large sums from a taxpaying to a non-taxpaying source. In other words, the Government lose the income-tax on the amount represented by the increase.

Restrictions on the output of gas may also be considered from another point of view. An eminent military authority recently mentioned the need for "munitions, more munitions." Among these requirements are petroleum, or at least certain distillates from it, and coal tar as a source of certain substances required for the manufacture of explosives. Restrictions on the distillation of coal cut two ways. They diminish the available supplies of tar, and encourage the use of petroleum for domestic purposes. So keenly do the Germans appreciate these points that we hear of drastic steps being taken to encourage the consumption of gas. Let us hope that the time may never come when our ruling authorities will have occasion to regret that they did not adopt systematic methods for removing, or at any rate minimizing, restrictions on the gas industry.

A great deal has been written and said lately about "increasing our trade." How is it practicable to do anything in this way when we are restricting output and profits in so many directions? Any attempt to introduce additional demands for material or labour can only increase the difficulties which are pushing existing industries close to breaking-point.

THE FORTHCOMING INTERNATIONAL GAS CONGRESS AT SAN FRANCISCO.

THE opening article in the last number to hand of the "American Gas Light Journal" is on the subject of the International Gas Congress to be held at the Panama-Pacific Exhibition in the week commencing on the 27th of September next; the author being Mr. E. C. Jones, of San Francisco, the President of the American Gas Institute. After giving some interesting historical particulars, and referring to the Congress held in Paris in 1900, under the presidency of M. Th. Vautier, and to that which was organized by the Western Gas Association in connection with the Louisiana Purchase Exposition in St. Louis in 1904, on the initiative of the President (Mr. F. H. Shelton), and with Mr. C. J. Russell Humphreys as Chairman of the Committee of Arrangements, Mr. Jones proceeds to tell the story of the origin of the one to which the members of the gas industry in America are looking forward with so much interest. The following are some extracts from his remarks.

When San Francisco was selected as the Exposition city to commemorate the completion of the Panama Canal, the Pacific Coast Gas Association decided that there could be no more fitting occasion to bring together the gas men of the world in an International Gas Congress than the celebration of this greatest of the world's engineering achievements; and so San Francisco was selected for the Gas Congress on account of the spirit of the people, and the wonderful location of the beautiful city covering the hills of the peninsular guarded by the Golden Gate. This charming cosmopolitan city on the Bay of San Francisco, with its charm enhanced by the delightful climate of California, is in itself a perpetual exposition.

As far back as 1911, the Pacific Coast Gas Association, at their meeting in Oakland, appointed a Committee on the International Gas Congress; and at the meeting in San Diego in 1912, a delegate was named to attend the meeting of the American Gas Institute in Atlantic City, in October, for the purpose of conveying an invitation from the Pacific Coast Gas Association to the American Gas Institute to participate in an International Gas Congress to be held in San Francisco during the Exposition period, to take paternal charge of the Congress, and to issue invitations to the Gas Associations of the world in the name of the American Gas Institute. This invitation was accompanied by one from the Panama-Pacific Exposition Company to the American Gas Institute, requesting that their annual meeting should be held in San Francisco in 1915. The delegate was courteously received, and there was much enthusiasm in favour of visiting California during the Fair. It was unanimously voted that the American Gas Institute should hold their 1915 meeting and participate in an International Gas Congress in San Francisco during the week beginning Sept. 27, 1915.

A Committee of nine members was appointed to arrange the preliminary details; and this Committee issued invitations to all the Gas Associations in the United States and Canada to participate in the Congress, and name a delegate to represent it on the Committee. As these invitations were accepted, the name of the Committee was changed to the "Joint Committee on the International Gas Congress, San Francisco, 1915." Sub-Committees were appointed to attend to the various details, and after several meetings the Joint Committee extended invitations to all the Gas Associations of the world to participate in the Congress.

There have been many acceptances of the invitation, and delegates have been appointed to attend the Congress. At the meeting of the American Gas Institute in New York in October, 1914, the previous vote taken was confirmed by a unanimous vote to hold the 1915 meeting in San Francisco. The Institute also elected as President Mr. E. C. Jones, of San Francisco, who had been previously honoured by being elected President of the Pacific Coast Gas Association. This was a graceful compliment to the State of California.

At a meeting of the Gas Congress Committee held in New York immediately following the meeting of the Institute, Dr. Alex. C. Humphreys was elected President of the International Gas Congress, and the Presidents for 1915 of the Gas Associations participating in the Congress were named Vice-Presidents. The selection of Dr. Humphreys is particularly happy, inasmuch as he represents the gas industry of the world; and while he is a member of nearly every Gas Association and many other scientific societies, he does not at present hold office in any Gas Association. It is felt that his selection as President is acceptable to all gas men, and that under his able leadership all the Associations representing different geographical sections and departments of the business may be brought together in harmony and accord.

The President and Directors of the Exposition have from the first recognized the desirability of providing for a series of congresses that would exceed in scope and excel in character anything heretofore attempted, and that would stand as a monument long after the material features of the Exposition have been forgotten; and for the accommodation of these many gatherings there has been provided the Exposition Memorial Auditorium, at a cost of more thon $1,000,000. The building and equipment will cost $1,250,000. The entire fourth floor has been reserved for the exclusive use of the Gas Congress. It has two halls 58 ft. by 138 ft., with two committee-rooms adjacent; and, by the use of rolling partitions, each of the large halls may be changed into five smaller halls, seating about 250 people each. The fourth floor also has two halls, 41 ft. by 64 ft., directly connected with the larger halls and to the main corridor, so that they may be used independently. All the rooms in the building are well lighted.

It is proposed to have sessions of the Congress each day from 10 a.m. to 1 p.m.; leaving the afternoons open for the annual meetings of the various Gas Associations, and allowing time to visit the Exposition and other points of interest. The details of the Congress are in the hands of Sub-Committees of the Joint Committee in the East, covering the departments of Arrangements, Publicity, Transportation, and Invitation; and the Committee on Papers, under the chairmanship of Mr. Alten S. Miller, is engaged in securing papers from representative gas men throughout the world, covering all fields of activity in the industry. The local arrangements for the Congress are being dealt with by a Committee of which Mr. John A. Britton, of San Francisco, is Chairman; and Sub-Committees will attend to the necessary arrangements at the meeting, of halls, registration, care of baggage, local transportation, hotel accommodation, and the

reception and entertainment of visitors. It is the earnest hope of the Pacific Coast Gas Association that San Francisco will be the Mecca of all gas men during the Congress.

The following American Gas Associations have decided to participate in the Congress, and have selected members to represent them on the Joint Committee:

American Gas Institute.
Empire State Gas and Electric Association.
Guild of Gas Managers of New England.
Illinois Gas Association.
Illuminating Engineering Society.
Indiana Gas Association.
International Acetylene Association.
Iowa District Gas Association.
Michigan Gas Association.
National Commercial Gas Association.
Natural Gas Association of America.
New England Association of Gas Engineers.
New Jersey State Gas Association.
Pacific Coast Gas Association.
Pennsylvania Gas Association.
Society of Gas Engineering of New York City.
Society of Gas Lighting.
Southern Gas Association.
South-Western Electrical and Gas Association.
Wisconsin Gas Association.

The gas industry at large is represented by Dr. Alex. C. Humphreys, the President of the Congress. He is a Past-President of the American Gas Light Association and of the American Gas Institute, the President of Humphreys and Miller, the Buffalo Gas Company, and the Stevens Institute of Technology. England was the first foreign country to accept officially the invitation to participate in the Congress; the Council of the Institution of Gas Engineers having selected Mr. Edward Allen, M.Inst.C.E., last year's President, to represent them on the occasion.

MIDLAND JUNIOR GAS ASSOCIATION.

A General Meeting of the Midland Junior Gas Association was held at the Technical School, Suffolk Street, Birmingham, last Saturday, when a lecture on "Benzol Recovery" was delivered by Dr. W. B. Davidson, the Engineer of the Nechells Works of the Birmingham Corporation Gas Department. The chair was taken by Mr. F. J. Ward, of Knowle (the President). The Council of the Association had invited members of the Midland Association of Gas Engineers and Managers, and several members of the Senior Association, including the Hon. Secretary, Mr. W. G. S. Cranmer, were present.

Extraction of Toluol on Gas-Works.

Dr. Davidson, in introducing his subject, said that the motto "Business as Usual" hardly applied to the industry under the present circumstances of national stress. They had to do more than ordinarily, in the particular direction indicated by his subject, so as to render definite help to the country. He gave an estimate of the amounts of raw benzol which were produced annually in this country from coke-oven gas and coal tar, and contrasted these figures with those applying to Germany. He also indicated the quantities of light oil recoverable from coal gas, stating that, though present in the gas in very small volume percentage, the figures were so great for gas made that the quantity reached a surprisingly high figure.

The lecturer sketched the methods adopted in coke-oven practice for obtaining light oils from the gas, and contrasted modern methods with those obtaining previously in reference to the distillation of the washing oil. The modern continuous still could, he stated, deal with more than ten times the quantity of oil which the old type could. He outlined the type of plant which had been adopted for use on certain works, indicating, by reference to a drawing, the manner in which the washing oil was circulated and used again and again. The oil could not be used continuously, as it becomes charged with naphthalene and tarry bodies, &c., so that it requires changing every few weeks.

Various details concerning the plant—such as the position of the washers on the gas stream, the type of washer most suitable, the kind of oil used and the temperature of the oil, the quantity of oil which gave best results, and the difficulties to be met with in the fractionation of the used oil—were dealt with by Dr. Davidson. He also explained the method employed in testing the gas for the content of the light oil fractions, and described the washing apparatus he had found most satisfactory and the manner in which the fractionation of the oil after absorption was carried out.

The apparatus employed was available for inspection on the lecture table, as also were detailed drawings of the plant.

Several of those present expressed their appreciation of Dr. Davidson's remarks, and asked for further information on various points affecting the works plant and the testing apparatus, among whom were Mr. W. C. Jones (Brierley Hill), Mr. W. Cranfield, Mr. W. G. S. Cranmer, Mr. C. H. Carder (Oldbury), and Messrs. Pearson, Jones, and Copeland.

Vote of Thanks.

The President proposed a hearty vote of thanks to Dr. Davidson for his kindness in giving his lecture.

Mr. Adams (of the Senior Association) seconded the proposition.

The vote of thanks was very warmly accorded.

Dr. Davidson replied to the vote and to questions on which further information was desired.

HIGH AND LOW PRESSURE ILLUMINATION.

An interesting lecture on "Illumination by High and Low Pressure Gas" was delivered last Thursday evening at the Municipal Technical School, Smethwick, by Mr. R. J. Rogers, the Assistant Fittings Superintendent to the City of Birmingham Gas Department. Councillor Shotton the (Vice-Chairman of the Smethwick Gas Committee) presided, and was supported by several other members of the Committee.

In introducing the lecture, Mr. Rogers reminded his audience that many of the earliest experiments in connection with gas lighting were made by William Murdoch within a few minutes' walk of the school, and that the genesis of practical gas lighting may be said to have taken place within the boundary of Smethwick. During the course of the lecture, the subject of high-pressure street and factory lighting was dealt with, and special attention was also directed to the hygienic value of gas for the lighting and ventilating of large lecture halls and public buildings. The latter subject was much appreciated by the students of Sanitary Science and Domestic Hygiene, who had been specially invited to attend the lecture, together with students of Engineering and Building Trades.

A large number of excellent lantern slides were shown during the evening; and at the termination of the lecture Councillor Shotton moved a hearty vote of thanks to Mr. Rogers, which was seconded by Alderman Thomas Walker, a member of the Smethwick Gas Committee.

SOME PHASES IN DISTRIBUTION.

By R. A. Briggs.

[A Paper read before the London and Southern District Junior Gas Association, March 26.]

In submitting my paper to you this evening, it will be my endeavour not so much to describe any particular system employed by some particular gas company, but to briefly review the distribution side of the industry generally, mainly from the outdoor representative's point of view—touching lightly upon certain phases, and emphasizing at greater length those which, to my mind, more directly affect the men engaged upon the district as inspectors, canvassers, and representatives. To attempt to give a full treatise upon the subject is not my intention; for it would be impossible adequately to deal with every phase in one evening. My one desire is that some of the thoughts expressed, however imperfectly, may lead to a good discussion, which, after all, is the main object; the interchange of ideas being to our mutual benefit.

It may appear to some that I am traversing a well-worn pathway; but, while fully realizing this fact, I would ask for your sympathetic attention and interest, for sometimes a well-known subject, viewed and discussed from a new standpoint, brings added knowledge. Another reason for my selection of the subject is the fact that the last paper given here was that by Mr. Hodgkin, of Reading, in May, 1911; so that nearly four years have elapsed since it was read before the Association. Even that paper was devoted to the consideration of a definite system of distribution; and, being one of two papers read the same evening, no time was available for discussion. In making this preliminary statement, however, I feel that a great injustice would be committed if I were to omit a passing reference and appreciation to two other papers given here since that date, both of which were of great value to the outdoor man. I refer to Mr. S. B. Chandler's paper on "Some Remarks on Gas Supply," and also that given by Mr. W. M. Mason, at the commencement of the present session—a paper both interesting and valuable, urging us on to personal effort in reaching the highest fitness for the responsible position we hold in the industry, at the same time sounding a warning not to be content with the mere mechanical performance of those duties which fall to us. With these few opening remarks, I will now pass on to the first point for consideration.

Distribution Department: Importance to the Industry.

The progress made in the gas industry during the present generation is little short of marvellous, and even during the last decade such improvements have been made that have surprised those who, believing that the utmost limit of success and usefulness had been attained, predicted the steady but sure decline of gas in the domestic and commercial world. The boom in the use of the new illuminant electricity in and about the year 1890 was looked upon as a death-blow to the gas industry. But it seemed as if new competition gave new life and energy; so that we here to-night find ourselves representing something of such great importance as to be recognized a necessity to modern life and conditions. With the development of the gas industry has grown the importance of the distribution department; and as we see it to-day, staffed with men of keen intellect and business ability, we feel that the future outlook is good, and that as new possibilities arise for extending the sphere of usefulness, thus increasing the sales of gas, they will instantly be made use of.

The engineer, by economical and efficient working aided by improved methods and machinery, has increased his yield of gas

per ton of coal carbonized, and at the same time reduced the cost of production; thus scientific manufacture and purification have reached a high degree of excellence. On the other hand, new possibilities ever open-up in the sphere of distribution; the successful dealing with these new fields of usefulness resulting in further progress and increased gas sales being maintained.

It is not my intention to go fully into the "profit and loss" aspect of distribution. In touching lightly upon it, however, let me say that it is one which requires viewing from a broad standpoint; and if the desired result aimed at—*i.e.*, permanent increase in the sales of gas—is attained, then the cost, I am sure it will be admitted, is justified by the results.

Another point upon which I intend to deal only lightly is the clerical or indoor staff of the distribution department. To adequately deal with the office staff and its routine is beyond my sphere and power; but if I were capable of doing justice to this important aspect, it would require more time and space than this paper permits. That the work of the office is important one must admit, and without its assistance the outdoor man would not achieve the success which he does.

Showrooms: Their Importance and Usefulness.

One of the finest advertisements to-day is, I consider, the gas company's show-room. Centrally placed in the heart of busy towns and cities, in normal times well and attractively lighted, and staffed by men whose knowledge and training specially fit them for this important position, the show-room soon becomes the centre of activity. The caller, attracted perhaps by the window display, upon entering the show-room finds both gas-fittings and appliances tastefully set out before him; while the courtesy and sound advice given as to the carrying out of his (or her) requirements often result in a new and permanent consumer—one who will not hesitate to recommend others to go where such courtesy and prompt attention are given, together with technical advice.

Another outstanding feature is the quality of the burners supplied with the fittings sold at the show-rooms; all gas companies realizing that the burner and its efficiency are of the utmost importance. This, I think it will be agreed, is in striking contrast to the cheap and inefficient article often supplied with fittings obtained elsewhere. The prevailing custom of fitting-up various kinds of apparatus, so that a practical demonstration of their use can be given, has proved a great help in securing orders.

The establishment of depôts in each district controlled by a gas company seems advisable, and where it has been tried has resulted in the work being carried out more expeditiously with a saving of time and money. Where it has been possible to establish such depôts in conjunction with the show-rooms, the advantages have been even greater both to company and to consumer. The creation of special departments to deal with special kinds of work seems also worthy of consideration.

As new spheres open up for the use of gas, and new appliances are evolved, problems confront the outdoor man which have not been encountered before. Let us take as an example water heating by gas, especially for domestic purposes. In order to successfully deal with this new field of usefulness and source of revenue—one which I believe has a great future before it—the whole science of water-heating, embracing the tank, cylinder, secondary, and other systems, each with its peculiarities, must be grappled with and understood. The representative on calling to advise the consumer is not always able to tell at a glance the efficiency of the existing installation for heating purposes; and, as is sometimes the case, the customer has only come to the company when the coal-range has not successfully heated the water required for the bath and other domestic purposes, the trouble is only made apparent after a gas-heated circulator has been installed. Then it is the case of either curing a faulty installation or removing the gas appliance—a thing which the district man will always try to avoid. Taking this as an example, it does seem to me that a special department of men trained for this particular work would most successfully deal with such cases.

In order to guard as much as possible against failure in connection with hot-water work, some companies have adopted the plan of instructing their representatives to make a sketch of every installation examined, with a view to estimating. That such an idea is excellent will, I feel sure, be admitted; but even then trouble is sometimes met with, either in the tank connections or other part of the installations, which a preliminary examination such as the consumer usually permits does not reveal.

The same argument in regard to special departments applies to a certain degree to the fixing of gas-fires. Sometimes difficulties are met with, either of ventilation or chimney trouble, which call for special consideration and treatment if complete satisfaction is to be obtained.

The formation of special departments for dealing with complaints and maintenance of burners is now a recognized thing with most gas companies, and calls for little comment here, except to say, in passing, that the special training and efficiency of the men employed in this manner are important factors in the success of any undertaking.

Reverting to the consideration of the staff of the distribution department I would draw your attention to the district inspector—a man in personal touch with the consumer, and upon whose individual effort a good deal depends. Dealing with the knowledge and the abilities of the inspector, the conditions of the present day demand that he must possess both practical and technical knowledge of his business; and the combination of these two qualities will win the respect of both consumer and employer. It is often surprising to find what technical questions are sometimes put to the outdoor man in the course of his duties; and to be able to intelligently answer such questions often goes a long way to win a customer. Then, practical knowledge is also most necessary, in order to grasp the existing state of things and be able to apply the use of gas to meet the requirements of the consumer in the most satisfactory manner. The inspector of to-day has every opportunity placed in his way to improve (or acquire) both technical and practical knowledge of his calling. By means of the Technical Press, classes, lectures, &c., the results of both scientific research and practical experience are passed freely on to him and at his disposal; so that, if only full advantage is taken of the opportunities offered, he is able to carry out his duties to the satisfaction of all concerned.

One's education is never finished; for as improvements in every kind of lighting and heating appliance are brought out, it is the duty of everyone to become fully acquainted with all their special advantages in order to more intelligently advise the consumer when the opportunity arises—thus enabling us to keep pace in the march of progress. The existence of such an Association as this gives fine scope for gaining both practical and technical knowledge; the time and trouble taken to attend the lectures and visits being more than compensated for by the knowledge gained.

Improvements in Apparatus.

Passing on to my next point, one of the signs of progress is the almost remarkable improvement in the apparatus used in gas distribution, both in design and efficiency. The gas-fire, with its ball fuel, heating chambers, and other characteristics which held sway for so many years, has almost disappeared, giving place to a new style entirely, with advantages both in efficiency and hygiene, such as the elimination of high temperature caused by convection, added radiation, improved ventilation, &c., not to mention improved design and method of adjustment. The modern gas-cooker has also been brought up to date, and those who had to deal with the old-type bolted burners and parts, after having been in use for a good time, best appreciate the modern idea of loose burners and supports, &c. The difference in the cost of maintenance between the old and newer type of cooker is also a point worthy of consideration. The improved construction of the gas-cooker burners has also resulted in increased efficiency in the modern type of gas-stove.

Turning to domestic water-heating appliances, the geyser has been improved, either by locking taps or automatic control, so that the possibility of accidents is considerably lessened; while the price has been placed within reach of the man of most moderate income, notwithstanding the advance in cost of both raw material and labour. The present-day gas-heated circulator has also advantages which enable it to more successfully fulfil the duties required of it; and the advent of the thermostat has supplied a long felt want. We are indeed indebted to the manufacturer for the progress made, and feel sure that in the future such further improvements will be made as will result in even greater efficiency. The demand is made, and the manufacturers supply the want.

Another kind of apparatus which has proved of great benefit, especially in the heating of large buildings such as churches and chapels, is the gas-steam radiator, which, with its simplicity and automatic control, has proved a great success. The large number of cinemas and skating rinks has also provided a good field for this kind of appliance; one of its advantages being the comparatively low cost of installation.

Question of Waste Heat.

Let us now for a few minutes consider the question of waste heat, one which, if our apparatus is going to be most successful in its results, is of utmost importance. A cubic foot of town gas, properly burned, gives off a certain quantity of heat energy, and the more we can utilize of this given quantity the better for us; for waste heat benefits no one—not even the gas company. The consumer who is satisfied is the one who obtains the best results in the most economical manner, whether it be from the gas fire, cooker, geyser, circulator, or any other appliance. In fixing different kinds of apparatus I have been surprised, on making tests, at the range of difference in the temperature of the flue gases; and it seems to me that if one make of apparatus can give a low flue temperature result, then others, under the same conditions, should—thus showing possibilities of further restriction of waste heat. Of course, in making these remarks I am not losing sight of the fact that some heat must be allowed to pass to get rid of the products of combustion.

I suggest that it is necessary to test every kind of appliance before placing it upon the sale or hire list—and this I believe some companies do—so that its efficiency could be ascertained and its special advantages noted, with any special feature of its construction examined, so as to enable those dealing with it to do so in a more intelligent manner. By this means such knowledge and experience would be obtained as would benefit both consumer and those having to deal with the particular piece of apparatus, whether inspector, representative, or show-room attendant.

The Modern Gasfitter: His Efficiency and Opportunities

The gas-fitter of to-day is a totally different individual from him of twenty years ago. Education, improved conditions of living, and other circumstances have combined to produce a man who

is far in advance of his predecessor, both in abilities and intelligence. The gas companies have been the first to recognize the importance of educating and training the fitter so as to enable him to carry out his work in an intelligent and satisfactory manner. It is the custom with several companies to subject fitters in their employ to a practical examination, followed a short time afterwards by one in theory. The advantages of such a plan cannot be over-estimated. Every inducement is held out to the fitter to improve his knowledge, and, taken advantage of, the result is a mechanic well trained and a credit to his employers. So much has this been recognized by the consumers that the company's fitter is called upon to carry out work required to be done whenever it is possible to get him. This reflects great credit upon those in control; and the fact that lads just leaving school are being trained in every branch of gas-fitting by the companies, combined with the additional advantage of the theoretical classes to which the lads are sent, certainly speaks well for the future of the industry.

Co-Partnership.

And now just a word concerning this ever-present topic "Co-Partnership." The late Sir George Livesey, in bringing out this wonderful scheme, gave to the workers of the industry an interest which had never been known before; for everyone connected with it was brought to feel that he had some part in the concern by which he was employed, and that upon his own individual effort, at least to some extent, depended the success of the whole undertaking. This, I think, was the underlying thought of the great benefactor when he unfolded his scheme; and the fact that it is the only one that has successfully bridged the gulf between capital and labour is a monument to the memory of the great man. Not the least important feature of the co-partnership scheme is the plan of investing the bonus granted to the employee in shares of the Company, giving the employee the advantage of a good sound investment, increasing with his years of service, and finally assuring to him in his old age such added comfort as would otherwise be impossible.

In conclusion, let us face the future with the spirit of optimism, determined that whatever confronts us, we will do our share in the march of progress. In this time of national crisis, which has affected every industry, we should so marshal all our forces, both in the distribution and other departments, that when the happier times of peace shall come upon this and other nations, we may be found united and in a position to advance further into fields of usefulness.

DISCUSSION.

The President (Mr. J. Hewett, of the South Metropolitan Gas Company) remarked that the Association had not had a paper on distribution for quite a long time; and as the membership roll was made up largely from those on the distribution side of the business, Mr. Briggs's paper should be helpful.

Mr. W. E. Brown (Gas Light and Coke Company) said he took it the author meant that inspectors and office staffs should be domiciled, not at the head office or works, but at district depôts or show-rooms. With an undertaking covering a large area, the advantage of such an arrangement must be apparent. Of course, in opening branches establishment charges must be considered; but, on the other hand, it was quite surprising how much money could be spent in fares, and how much time could be taken up in pushing trucks and proceeding to jobs a long way off. With regard to advocating special departments—or, perhaps, it would be better to say special sections of the distribution department—to deal with particular kinds of work, this plan was attended with excellent results where work was done on a sufficiently large scale; but it sometimes meant that two sets of men would have to be sent to a house, instead of one set. The great advantage was that each set was more expert in its particular line. With reference to hot-water installations particularly, it was unwise to undertake them unless there was someone in charge who thoroughly understood the work. Before giving an estimate for a hot-water installation, it was very advisable to ascertain diplomatically whether the existing range system would work well. As to the qualifications of inspectors, it had to be remembered that an inspector had different duties in different circumstances. In one case he would be practically a foreman with control of the men, while in another he might have very little to do with workmen. It all depended upon the magnitude of the undertaking. The author said an inspector should be a practical and technical man; but it was equally important that he should be a good commercial man. The inspector represented the gas company in the eyes of the public; and the company's commercial reputation largely depended upon the manner in which he handled business, either by correspondence or interview. He must rise above the level of a good mechanic. The public expected to transact their business with a properly qualified commercial man.

Mr. F. C. Briggs (Gas Light and Coke Company) said it seemed to him that the author had pictured an ideal condition of affairs. They must all wish sometimes that things were exactly as he said. The quality of the burners, &c., sold in show-rooms was an important matter to keep in mind. With the remarks as to the establishment of a depôt in each district, he was fully in agreement. A fair-sized company could not, perhaps, have more than one or two show-rooms; and what would meet the case would be a room or small shop, which could be arranged as a depôt for the fitters, &c., and for customers to call. Mr. F. W. Goodenough said some days ago that if people wished to obtain the best results, they should go to their gas undertaking and get really good mantles. If it was necessary for consumers to go several miles for these mantles, there might be difficulty in selling them; but with depôts where they could be had, and where there was someone to attend to complaints, the matter would be simplified. A special department to deal with hot water seemed absolutely necessary, because here they had factors which did not come within the training of the gas man. But from the consumer's point of view it was well not to have too many men calling at one house. Excluding hot water, as far as possible one man should do a job. A district inspector had to be a man of many parts; for he had to deal with all kinds of people. The testing of all apparatus before placing it on the sale or hire list was a good thing to advocate, and big companies did it. Another point of importance was to tell consumers how to use things; and if a leaflet could be issued to inspectors giving the results of tests that were made of apparatus, and possibly the construction of it as well, this would go a long way in assisting them to master the peculiarities of different appliances and to understand the duty that could be expected of them. Of course, such a pamphlet would have to be confidential.

Mr. J. G. Clark (Gas Light and Coke Company) emphasized the importance of advising consumers to buy things which were going to be a credit to gas. He had noticed recently in a shop-window where odds and ends were sold inverted incandescent burners made entirely of metal, with the bunsen tube simply a piece of brass tube bent round with sharp bends, and a gallery put on. Such a burner was not likely to give more, and probably less, than one-half the efficiency that one would get from a good burner. While gas companies were out selling light, they ought to sell it as cheaply as possible; and if they gave only one-half the possible light, it would be relatively twice as expensive. The consumer should be encouraged, when he wanted anything connected with gas, to go to the gas company for it; and this applied not only to burners, but to other things as well. Some of them had heard of geysers being fitted without flues, though they knew it was absolute folly to do such a thing. It was done at very great risk; and if a consumer went to the gas company, he would be guarded against a danger of this kind, which would be all to the good. Speaking of water-heaters, he noticed a remark in the paper that with different makes of apparatus the flue temperature varied under the same conditions; and he inferred from this that the author assumed the efficiency bore some relationship to this flue temperature. One ought, however, to be very careful in inferring efficiencies from such figures, because the temperatures of the gases passing out of the exhaust depended not only upon the amount of heat but also upon the amount of air passing from the apparatus; and different designs of water-heaters gave different effects. There might be a piece of apparatus which the products were leaving at (say) 250°, and if they restricted somewhat the air supply feeding the burner and passing from the central flue, they might expect the temperature of the exhaust products to go up. But it did not follow that the amount of heat escaping would be larger. One design of water-heater might allow more air to pass from the combustion chamber than another; and therefore deductions based on flue temperatures had to be accepted with some caution. Gas companies, like everybody else, had, of course, only limited accommodation in their show-rooms; and, moreover, they were for obvious reasons compelled to simplify their business and to standardize it to some extent. But a progressive company took care to know all about practically every appliance, so as to be able to advise consumers as to the wisdom or otherwise of installing it. The gas company should always know that an apparatus fixed was going to be satisfactory. When an appliance was sold, all the trouble that might arise with it afterwards was brought to the gas company; and it was up to them to reduce these possible troubles to a minimum, by seeing as far as they could that apparatus installed was well designed and well made.

Mr. J. R. Gale (North Middlesex Gas Company) referred to the desirability of educating consumers. In order that any apparatus might be efficient and satisfactory, it must be used in an intelligent manner. Much trouble and disappointment would, he said, be avoided if it were impressed upon people that appliances should be employed with due regard to economy.

Mr. W. L. Westbrook (North Middlesex Gas Company) remarked that, judging from his own experience, it was generally a good plan, in putting down gas hot-water circulators and boilers, to leave the existing system altogether alone. In many cases connection could be made successfully with existing flow and return pipes; but it was far better to leave them alone and put in new pipes of a suitable size for the gas-boiler, which range pipes sometimes were not. When arranging for an installation, the inspector should satisfy himself that the boiler was going to be used under the best conditions. They should be careful to make the apparatus as efficient as possible, and thus increase the popularity of water-heaters. With regard to testing-apparatus, this was very necessary, and ought more often to be done. The idea had been several times mooted of providing a central station for this purpose, for the benefit of companies who were too small to undertake the whole thing for themselves. He supported Mr. Clark in what he had said as to flue temperatures, and would add that the questions of the pull of the flue and whether there were open ends to the tee affected these temperatures. In testing boilers *in situ*, one never came across two sets of conditions precisely alike. There were a certain number of heat units in the gas; and

the efficiency of the apparatus should be judged by the proportion transferred to the water.

Mr. F. AINSWORTH (Ilford) remarked that the distribution department was, as the author had stated, a very important one. They should not study the immediate profit and loss, so far as distribution was concerned. The question should be, not whether a job would pay at once, but whether it would pay eventually. Most gas companies now were fixing cooking and heating stoves on such conditions as would not pay, unless they remained in position; but, of course, it would be found that what they were doing this year would help them in the next. He hoped to see the day when those who had to enter-up work done—show-room attendants, and storekeepers—would be selected from the most intelligent of the fitters. In these positions they ought to command a wage which would make it worth while for them to qualify for the work. An intelligent and practical man combined, in the departments he had named, was of great assistance. He was pleased to hear Mr. Clark's remarks as to waste heat. The time was coming when they would not lose the amount of heat they were now doing. Speaking particularly of cookers, the chief thing was to get proper combustion at the burner, without any smothering; and this could only be obtained by arranging the mixture of the gas and air at its right place, outside the oven. Manufacturers were dealing with the matter; and cookers could be made so that there would be complete combustion, and no smothering. Apparatus should be tested by those who were thoroughly acquainted with the conditions prevailing in the district. They should be able to tell people just what apparatus could be depended upon to do; and then it would be used to the best advantage.

Mr. S. B. CHANDLER (South Suburban Gas Company), who was unable to be present, forwarded some remarks which were read at the meeting. In the course of these, he said the author voiced the practice of many undertakings whose administrators, recognizing the difficulty of obtaining new, or even retaining existing, business, had formed special commercial or canvassing departments to cope with modern conditions. These were staffed with men fully alive to the exigencies of the times, and specially fitted, by reason of their technical training and knowledge, to advise consumers upon the many questions arising. Gas appliances had undergone wonderful changes; and the scientific application of gaseous fuel for all purposes had progressed to an extraordinary degree. Not only with gas had the advance been made, but also in connection with electricity. Thus it was of the utmost importance that any man representing a gas company as inspector or canvasser should be *au fait* with the various appliances he wished to introduce, and should have as clear a knowledge as to the capabilities and limitations of the other side as he had of his own business, in order to be in a position to give on the spot comparative costs and full information to a wavering consumer. Excellent as the show-room might be, it must be remembered that those in contact with the consumer—presenting the case for gas in a favourable and truthful light, exhibiting thorough knowledge of the subject, and bringing conviction by the statements made—assisted in rendering them successful, and a centre of reliable information. With reference to the training of gas-fitters, the practical and theoretical examination held recently by the City and Guilds of London Institute was an excellent step; and he believed the young fitter himself was beginning to appreciate and take advantage of the many opportunities he now had for the acquisition of knowledge. From this not only must the fitter benefit, but the gas industry generally. Water heating by gas had a very great future before it; and the formation of special departments to deal with this class of work was becoming fairly general. A successful installation giving satisfaction to the consumer was a constant advertisement for the gas undertaking, and bound to prove a source of recommendation. The testing of appliances before placing them on the hiring list was already carried out by many companies. One should be somewhat chary of taking makers' figures—test conditions could not always be the same, and circumstances must vary in different districts. All appliances, therefore, should be subjected to tests under ordinary working conditions by companies who proposed to adopt them. The suggestion should, he thought, be carried even farther. New appliances were constantly coming along, and it would be of great benefit to inspectors and representatives, and those whose duty it was to deal with and fix such apparatus, for models or samples in section to be shown, and explanations given of the various novel features. The present was a time of great anxiety for all companies; and the increased price of gas was likely to act as a deterrent in the obtaining of new business, unless special efforts were made to give satisfaction to consumers.

The PRESIDENT remarked that a good deal had been said about hot-water circulating systems. It had been his privilege to be asked to act as an examiner in connection with the practical examination for gas-fitters. This was the first year that it had taken place, and there had been certain criticism passed, to the effect that the questions were not in some cases considered quite difficult enough. The practical work, perhaps, was not so difficult as it might have been. Some of the tasks set were performed by the men in what one might term "record time." This not only showed ability on the part of the candidates, but it also reflected very favourably on the teachers they had been under. There was one question set to the final students in connection with a hot-water system, which showed that the examiners expected a fitter to know something about hot-water installation. A sketch was supplied of a circulating system with several faults in it, which, he would venture to say, would not have been immediately apparent to some people who might consider they knew something about hot water. The student, however, had the question sprung upon him, and had a quarter-of-an-hour to put matters straight. Personally, he had only one student to examine in the final grade; but to his mind the man did very well, and showed that he had a really good idea of what a hot-water installation should be. With regard to Mr. Ainsworth's plea for the practical man, he (the President) would like to see some of the inspectors, &c., selected from among the fitters, because there was no man better able to criticize a job than one who could do it himself. A judicious mixture of the theoretical with the practical was desirable.

Mr. BRIGGS, in reply to points raised in the discussion, said that, of course, the branch depôt or show-room should be the point from which the whole of the work for the particular district was handled. Where it was possible to have the depôts in conjunction with show-rooms, so much the better; but if this entailed too great expense, the depôts alone, with inspectors and fitters, would do. In connection with gas undertakings, there were some departments which called for special attention. That was to say, some work could only be handled by a specialist. With the smaller concerns, there were, no doubt, difficulties in the way of this. It was no use having an inspector unless he was a good commercial man. He must be able to secure business. It was quite true that in his paper he had presented an ideal state of things. It was by striving after perfection that they might hope to get somewhere near it. A show-room should be of first-class character. If they were going to have one at all, it should be of the best. In London the show-rooms were, without exception, excellent advertisements for gas; but this was not the case everywhere. As to the suggestion that inspectors should be fully informed of the results of tests of apparatus, he would go further, and let the inspectors test for themselves. If they were intelligent men, they would soon find out any defects. There had been much imperfect stuff placed upon the market; and of this the gas companies had to bear the burden. With regard to the question of exhaust gases which Mr. Clark had raised, he might say that the test he made was with practically similar apparatus, with the combustion chamber about the same size and the flue outlet about the same; and there was a very wide variation of temperature. It seemed to him that if an apparatus was giving a flue temperature of only about 260°, they would be getting a better efficiency from it than they would with one from which the products were escaping at a temperature of over 600°—under similar conditions. He thought this waste heat should be further restricted. Their fight against coal, coke, and other things called for the utilization of as much of the heat as possible. It was right that consumers should be advised to use apparatus intelligently; and one could wish that they would always take the advice. If only a thermostat operating the gas-tap could be fixed on kettles, it would do a great deal of good. [Laughter.] It would be an excellent thing, when fixing hot-water systems, to leave existing installations entirely alone; but it was doubtful whether the consumers would agree. In many cases they would not put up with the disturbance of putting in new pipes, or with the expense. The provision of a central station for testing purposes would be a splendid idea for the smaller companies. He had not said much upon the profit and loss aspect of his subject; for this opened up a very big question. As he remarked, if a permanent increase in the sale of gas was obtained, the cost was justified by the result. With regard to Mr. Ainsworth's suggestion, if they could get the pick of the fitting department promoted, it would be for the good of the industry.

Mr. AINSWORTH proposed a hearty vote of thanks to the author for his paper.

Mr. S. A. CARPENTER (North Middlesex Gas Company) seconded, and remarked that it was the only paper this session which had been read by a member of the Association. The distribution department was specially important now, when there was so much decrease in consumption to be made up. Prompt attention either to a complaint or to an order was one of the finest means of advertising that a gas undertaking possessed.

The vote was heartily accorded.

Evening Star Lodge.

The installation meeting of the Evening Star Lodge, No. 1719, was held at the Freemasons' Hall, Great Queen Street, on Wednesday last. The retiring Master, W. Bro. Edmund G. Smithard, of King's Lynn (who was presented with a Past Master's Jewel), installed his successor, W. Bro. Arthur E. Croager, P.M. of the Lullingstone Lodge, No. 1837, P.P.S.G.D., Kent. Subsequently, the following officers were appointed and invested:—

S.W.	Bro. J. F. Wicks
J.W.	„ A. P. Main
Secretary	W. Bro. Walter T. Dunn, L.R.
S.D.	„ „ F. J. West
J.D.	„ „ Packham, P.P.J.G.D., Surrey
I.G.	Bro. Corbett W. Woodall
Director of Ceremonies	W. Bro. William Edgar
Organist	Bro. John F. Simmance
Stewards	„ Herbert G. Warren
	„ Alfred C. Beal
	„ Charles Clare

W. Bro. Arthur Valon, re-elected Treasurer, was also invested.

THE RATING OF LAMPS.

At the Meeting of the Illuminating Engineering Society on the 16th inst., a discussion took place on the rating of lamps. Nominally it was intended to be a discussion on the practical rating of electric incandescent lamps; but remarks were made by several members of the gas industry, and there was a general feeling that something should be done to arrive at a standard of rating which would be applicable to gas as well as electric lamps. So far as electric incandescent lamps are concerned, lamp makers prefer to rate their products on the basis of the watts or power put into them; while those responsible for planning lighting installations, and who also claimed to speak on behalf of the general public, urged that the light-giving properties of the lamp should be the basis of any system of rating.

Mr. C. H. Wordingham said the fear of the central station man seemed to be that he would be handicapped in competition with other illuminants if he told the truth about the lamp. If the central station engineer wanted to displace other illuminants, he must do so by competing in price. Reduce the price of electric lighting, and its use would spread. The public did not care twopence about watts or cubic feet of gas; they wanted a certain amount of light and to pay the least they could for it.

Mr. F. W. Goodenough, in a communication, said: The question of rating and marking units of illumination in such a way that the user can tell exactly what he is buying, is a very important one; and if the Illuminating Engineering Society can do anything effective in the direction of establishing standard methods of specifying the illuminating value of such units, they will have done useful work. At present, the buyer who is not equipped with a photometer is largely dependent on the commercial honesty of the seller, which is often widely different from his personal honesty—he is too frequently inclined to yield to the temptation of fighting the dishonest man with his own weapons. We want to get away from "nominal" ratings to actual ratings based upon a common standard. In regard to points set out in the memorandum issued as a guide to discussion, I should like to make the following brief observations. First, I see no reason why lighting units should not be rated and marked in both energy and candle power. The user wants to know what light he will get, and what quantity of energy he must pay for in order to obtain it. If he is only told a lamp is 30-candle power, he will reply: "How many watts (or cubic feet) will it consume per hour"? If only told a lamp is a 75 watt or a 2 cubic feet per hour lamp, he will at once ask: "What light will it give"? The two factors, energy and light, are not always in the same ratio one to the other, and ought therefore both to be specified. Secondly, I do not consider that any necessity exists for the introduction of the lumen basis in lieu of the candle-power basis, with which the public is familiar. All that is required is a standardization of what is meant by the candle power of a lamp. Thirdly, in defining what is meant by candle power, I am in favour of mean spherical candle power; while for the selection of types of lighting unit for various purposes the illuminating engineer needs to have polar curves obtained from the complete unit as it would be used. These would give him the necessary information as to candle power in particular directions, and would enable him to ascertain the mean lower hemispherical candle power, &c. But it would be more convenient if more data were given as well as the polar curves. It is obviously desirable to adopt recognized symbols as suggested; but the signs for upper and lower hemispherical candle power should be open and not closed curves, to prevent any possibility of confusion in manuscripts or small print. It appears quite practicable to adopt foot-candles on the working plane as the basis for specifications for interior lighting; but the illuminating engineer will, of course, require from the supplier of the installation a guarantee as to the hourly consumption of energy required to give and maintain as a minimum the specified illumination. A difficulty obviously exists in the marking of a light unit such as a gas-lamp, which is composed of several detachable parts—burner, injector, mantle, globe, reflector, &c.—the correct combination of which is required to give the normal lighting efficiency of the unit. The rating of such a unit must necessarily be stated to be subject to the replacement of the mantle, as and when necessary, by one of similar quality, just as the rating of an electric incandescent lamp must be stated to be subject to its replacement as soon as the filament has become depreciated in lighting power. In other words, the rating of all lighting units must be recognized to be in relation to their efficiencies when new. The particular point that should be emphasized is that if users wish to obtain from the energy they consume the maximum lighting efficiency, they should go to their gas undertaking for mantles, which are bought on a quality first basis and submitted to stringent tests, or to their electricity undertaking for advice as to the purchase of lamps, and not ruin a good installation by using "cheap" mantles or filaments to replace those which were capable of giving the specified candle power.

Mr. Edward Allen, in a communication, said: I fear that the time has not yet arrived for a standard specification for burners and mantles, as the conditions of pressure and composition of gas are not uniform throughout the country. At the present moment we have no specification for burners, but have lately tested a large number with the object of finding out which gives the most satisfactory results. The variable effects we have had to contend with are pressure, specific gravity, and composition of the gas. Any and all of these conditions have a very determining influence over the bunsen flame; and we have ascertained that the best practical burner is perhaps one of the simplest and the cheapest. Burners which have interchangeable parts, and which are supposed to be suitable for a special gas, have not proved satisfactory. Swing burners with bayonet fittings perhaps lengthen the life of the mantle; but if they do not hang perfectly vertical, they become an eyesore. Burners which allow the products of combustion to mingle with the primary air do not give a very good efficiency. The uses of wire gauzes in burners are not successful, because they, like metal nozzles, burn away. The injector plate should not be a mere thin stamping, but at least 1-32nd inch thick; so that the holes may be of such a form that control of the jet is obtainable. Mantles are purchased by my Company on results from experiments. Tests are made as follows: Three mantles are chosen out of a parcel; one is tested for illuminating power, the second for hours of endurance, the third is placed upon the shocking machine and tested for strength. In reference to the candle power, we have made tests of lamps by which we have obtained polar candle-power curves; this result being largely governed by the use of a reflector as well as the position of the mantle inside the lamp. As to whether the candle power of a lamp should be expressed in mean spherical or mean lower hemispherical candle power, seems to be unnecessary. So many factors control the average hemispherical result which may be detrimental to this term. The lamp is entitled to be termed at its maximum candle power on a certain angle. In any case a standard candle power should be maintained for all illuminants.

Mr. C. C. Patterson (National Physical Laboratory) pointed out that a great deal had been said about watts; but this was only applicable to electric lamps. He submitted that there was one principle which the Society should champion above all others, and that was the desirability of having a rating which would cover all forms of illuminants, and which would be uniform for all kinds of illuminants.

Mr. J. G. Clark (Gas Light and Coke Company) showed some lantern slides illustrating the variation in candle power from the point of view of distribution. As representing a gas company, he frequently had to advise consumers, a very large majority of whom came to the gas company to purchase their lamps and fittings. In order to be able to give this advice it was necessary to have definite information about lamps. He had always been led to regard the total candle power curve—*i.e.*, the polar curve—together with the consumption, as the only true expression of the power of the lamp. He had advised his principals for some years to accept these as the true rating of a lamp. From them they could get everything they wanted—*i.e.*, lumens, foot candles, mean hemispherical candle power, or anything else. They could also settle heights and spacing ratios, and so be able to advise customers. A point had occurred to him in connection with the rating of gas-lamps. It was usual to express candle power in any given direction in the terms of the consumption of one cubic foot per hour. Unfortunately, in the gas business there was no term equivalent to the watt to represent the rate of consumption. A new term, however, might be coined to express this—*i.e.*, they might take the first part of the word "cubic" and the last part of the word "hour" and say "cubour," as representing a consumption of one cubic foot per hour. This seemed a suitable name which might simplify matters. Another suggestion occurred to him. A gentleman named Murdoch, who was regarded as the inventor of gas lighting, was contemporary with Watt. Why not immortalize Murdoch's name and use it to represent the standard rate of consumption? Twenty-five cubic feet per hour might then be called a "Murdoch." It sounded a quaint expression when stated for the first time; but it was simpler, and both Watt and Murdoch would then be used as representing rates of consumption. With regard to expressing illumination data for interior work, he saw no difficulty in specifying a certain number of foot candles. Indeed, he thought it very desirable that some such principle should be accepted and used by architects and engineers; so that those who had to provide the light ultimately would be able to set about the job in a scientific manner.

Mr. Bussel suggested that, if different names were to be adopted for different forms of lighting, there should be a standard for oil lighting, which might be called a Rockfeller.

BENZOL AND TOLUOL FROM CRUDE PETROLEUM.

Dr. Rittman's Processes.

In the "Journal" for the 9th inst. (p. 574), some comments were made upon a statement in a London daily paper to the effect that Dr. Walter F. Rittman, the Chemical Engineer to the United States Bureau of Mines, had made important discoveries which might render America independent of Germany for supplies of materials needed for the production of dyestuffs and high explosives. Two chemical processes are concerned; and the following particulars in regard to them have been issued by the Secretary of the Interior (Mr. Lane).

The first of these processes promises to enable the independent refiners to increase their output of gasoline 200 per cent. or more, which, with an estimated production on their part of 12 million barrels of gasolene in a year, will mean an output from the inde-

pendents alone of 36 million barrels, more than the total production to-day from all sources. The second process includes the manufacture from crude petroleum of toluol and benzol, heretofore obtained from coal tar or coal gas. As Germany has specialized far beyond other countries in bye-products from coal, the rest of the world has been dominated by her as regards toluol and benzol products, which are the bases for the production of dyestuffs and high explosives. Application to patent these processes has been made by Dr. Rittman on behalf of the Federal Government, in order to prevent any monopoly in their use—the patents to be dedicated to the American people.

Referring to Dr. Rittman's discovery, Mr. Lane says: These processes are fraught with the utmost importance to the people of America. For some time the Standard Oil Company, through its employment of experts and its extensive organization, has had a big advantage over the 'independents' in the production of gasoline, having a patented process that obtains nearly three times the usual amount of gasoline from a given quantity of petroleum. Now the Federal Government proposes to make free for the use of all the people of this country a process that is confidently expected to increase the yield of gasolene from petroleum fully 200 per cent.; and it is claimed that the process is safer, simpler, and more economical in time than processes now in use. . . When it is realized that the gasoline industry in this country each year yields products of between $100,000,000 and $150,000,000, the importance of this discovery is clearly seen. The second process discovered by Dr. Rittman may prove to be of even more value than the first, in that it suggests the establishment of an industry in which Germany has heretofore been pre-eminent—the dye industry—and also promises indirectly a measure of national safety of incalculable import. Among necessary ingredients of high explosives used in modern warfare toluol and benzol are of the first rank. Heretofore these products have mainly been obtained in Germany and England from coal tar; and explosives manufacturers have had to depend largely on the supply from these sources. I understand that some toluol and benzol have been obtained from American coal and water-gas tars; but this supply does not begin to satisfy present demands. The Federal Government now proposes to obtain the toluol and benzol from crude petroleum also; and I am informed that the supply can be made sufficient not only for the entire American trade but also for other purposes. This process has gone far enough to indicate that the products can be produced at reasonable cost. The real comforting thing is that this new source of supply is at the command of our people; and if the nation is ever called upon to defend itself, we shall be able to manufacture the most efficient and most powerful explosives known in warfare. Dr. Rittman concludes from his experiments that this process may become more economical than the German method of obtaining these products from coal tar; and as it not only makes toluol and benzol, but also gasoline in considerable quantities, he intimated the possibility of gasoline being an important factor in paying the costs of the process. If this should prove to be true, it may result in eventually giving the United States the supremacy in the dyestuffs industry that has for some time belonged to Germany.

CONCRETE PILES FOR THE FOUNDATIONS OF GASHOLDERS.

It was mentioned in the general notice of the proceedings at the annual meeting of the New England Gas Engineers' Association which appeared in the "JOURNAL" for the 16th inst. (p. 671), that one of the papers read was on the subject of "Concrete Piles for Gasholder Foundations;" the author being Mr. F. E. DRAKE, of the Lynn (Mass.) Gas and Electric Company. The author described, with photographic illustrations, the process of making the foundations for a 5 million cubic feet holder; and the following is an abstract of his paper.

Originally all foundations were carried down to "hardpan;" but about 2000 years ago the first wooden piles were used. From that time onward piles became more and more common, and served their purpose well for supporting structures built upon land which was of uncertain qualities, providing they were cut off below the water-line, and always kept submerged. With the advent of concrete this was no longer necessary, for this material was found to be practically indestructible when it consisted of good constituents and was properly formed and set.

When the contractors from whom the holder in question was ordered came to deal with the matter of the foundations, concrete piles were decided upon, for the twofold reason of durability and cost. The preliminary tests showed that the conditions were ideal for concrete piles; while with regard to cost, it worked out somewhat as follows: First, carrying the excavation to the underlying stratum of sand about 12 feet below the surface of the ground, and supporting the tank bottom on a pad of concrete placed at this level, and then carrying a retaining wall, with an annular space, to 12 inches above grade, would have cost approximately 25 per cent. more than the concrete pile foundation. Secondly, carrying the excavation down to the permanent water level, about 6 feet below the existing surface, driving wooden piles to support the concrete pad, and then carrying a retaining wall with an annular space up to 12 inches above grade, would have cost approximately 33⅓ per cent. more than the concrete pile form.

The contractors told the author that the comparison of foundations, as developed at Lynn and given above, was likely to be misleading if used as a criterion for other localities. They said that a wooden pile foundation for supporting a holder such as the one at Lynn usually very much exceeded the figures given, which would make the percentage increase in cost of a wooden pile foundation as compared with one of concrete much greater in most localities. They gave him figures for wooden pipe foundations for 5 million cubic feet holders as constructed in three large cities; and the increased cost was as follows: A, 46 per cent.; B, 36 per cent.; C, 100 per cent.

The holder contracted for was to consist of four lifts in a steel tank, and it was to have the following dimensions:

Tank.—Diameter, 204 ft. 6 in.; height, 40 feet; bottom plates, 5-16ths to 7-16ths in. thick; shell, eight courses of 7-16ths to one 23-32nd in. thick.
Top Lift.—Diameter, 193 ft. 7⅝ in.; height, 42 feet; central rise of crown, 12 ft. 6 in.; plates, 3-16ths to 3-8ths in. thick.
Second Lift.—Diameter, 196 ft. 3½ in.; height, 42 feet; plates as in top lift.
Third Lift.—Diameter, 198 ft. 11⅛ in.; height, 42 feet; plates as in top lift.
Fourth Lift.—Diameter, 201 ft. 7⅛ in. height, 42 feet; plates, 5-16ths to 3-8ths in. thick.

The standards and struts were to be of I-beam and channel-iron construction, varying in size from 24-inch 80-lb. beams for the lower standards to 7-inch 12·25-lb. channel-irons for the separating members.

The holder when completed will have a total height of 211 feet, and a diameter of 204 ft. 6 in. There will be three 30-inch and one 20-inch inlet and outlet pipes, and the holder when inflated with air will throw a maximum pressure of 12·76 inches. It will have approximately 5,300,000 lbs. of steel used in its construction, and the water in the tank will weigh 84,678,500 lbs.; making a total weight of 89,978,500 lbs. for the foundation to carry, or, reducing this figure to tons, a total of 44,989 tons.

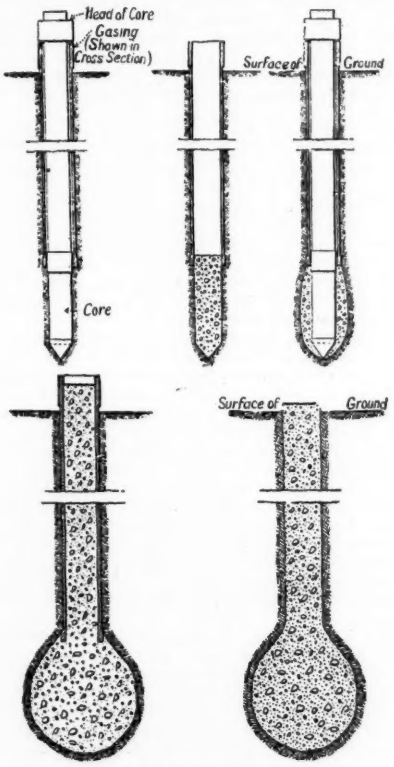
A Concrete Pedestal Pile.

Twenty-five or thirty years ago the site of the holder was some 12 or 14 feet lower than it is now; and this lower stratum was marsh land. This was pretty well known; but, to be safe, borings were made by driving ¾-inch extra heavy pipe. It was found by these tests that there was approximately 10 feet of fill, composed of almost everything, from ashes and clinker to brickbats and old fire-clay materials. Below this was found a hard layer of peat about 12 to 18 inches thick, and then there was probably a foot of soft muck, below which was found good hard sand mixed with clay. These determinations were corroborated when the piles were driven, for in every instance the piles "brought up" in the hard peat at a depth of from 10 to 11 feet, and, after forcing through this peat and then the soft muck, "brought up" in good hardpan at an average depth of 13 ft. 9 in.

The pile as driven is known as a "Pedestal" pile, and the method of driving and its formation are rather novel. After having determined, by means of test-pipes, the probable depth to which the proposed piles must be driven, a cylindrical steel casing 16 inches in diameter by ⅜-inch thick, with outside reinforcing bands top and bottom, and of the required length, is used as a form for the pile. Inside this casing is fitted a core, which is a smaller and longer pipe with a cast-steel point and an enlarged cast-steel head; the latter engaging the top of the casing, while the former projects some 4 or 5 feet below. In the head of the

core is fitted an oak driving-block, which receives the blows of the hammer used. For forming the pile, the core is fitted into the casing, and both are driven into the ground by a 3000-lb. steam-hammer, which has a drop of 36 inches, and delivers 38 blows per minute. The casing and core are driven to a refusal of 8 to 10 blows per inch. The core is then withdrawn, and the resulting void partly filled with a charge of concrete.

After the concrete has been charged into the casing, the core is lowered and used as a ram, driving down through the charge, which in this manner is compressed and forced out against the surrounding soil, pushing back and compacting the earth. The rammer is now withdrawn, more concrete shovelled in, and the ramming process again repeated, causing the concrete to be still further forced out into the surrounding earth. This ramming operation is carried to a refusal of about 15 blows per inch, at which time the charge has been forced into the surrounding soil, so that there is a base formed about 3 feet in diameter. The ram is then removed, and the casing filled to the top with wet concrete. The casing is now pulled up slowly and evenly, with the ram spotted on the concrete holding it in position. With the removal of the casing, the concrete falls into position, completely filling the thin space formerly occupied by the shell. With the withdrawal of the casing, it will be found that the surface of the concrete will have sunk some 3 to 6 feet, according to the length of the pile. The contractors claim that the volume of shrinkage conforms exactly with the volume of the casing wall which it replaces. The resultant pile shows a perfect concrete stem, 17 inches diameter, surmounting a bulbular base approximately 3 feet diameter. It is remarkable how evenly and smoothly the piles are formed.



Method of Forming the Pile.

The accompanying illustrations show the method of forming the "Pedestal" pile, and an actual pile formed in the regular manner. It was driven to a depth of only 8 feet, so that it did not fetch up in hardpan, which accounts for the rather flat footing. If it had been driven into hardpan, this footing, instead of being nearly flat as in the illustration, would have been bulbular, as shown in the diagrams. In either case, an excellent footing course is formed; and in the case of the foundation at Lynn, with piles spaced on 5 ft. 2 in. centres, there must be practically a continuous footing under the whole foundation. It can be readily seen from the picture that this form of pile must have greatly increased carrying capacity over the ordinary type, for it not only carries its load by frictional adhesion, but has the additional benefits derived from the direct bearing power of the broad base resting in the firm and compact subsoil.

The foundation as made at Lynn is 204 ft. 6 in. diameter, and the piles are on 5 ft. 2 in. centres; the total number being 1361. They are brought to grade with the exception of the outer row, which is left 3 feet below the surface, to receive an outer ring of concrete 2 feet wide and 4 feet deep. This ring stiffens the slab where the steel tank superstructure rests, and also goes into the ground far enough to prevent any lifting action through frost.

After the piles were completed, two ¾-inch round rods, for reinforcing purposes, were placed across the top of each line in both directions. Between these rods, and on top of them, extending both ways, were placed ½-inch rods; the latter being wired directly both to the ¾-inch rods and to themselves. When the reinforcing was completed, the piles were ready to receive the pad, which was about 12 inches thick.

Before the pad was poured, the two piles which brought up with the easiest penetration were picked for test. A pile on the outer ring was first tested. It was driven on the 30th of October, and tested on the 13th of November. It was 11 ft. 6 in. long; being left below grade, since it was on the outer ring. The load applied was 45 tons, and the pile showed a total settlement of 9-32nds of an inch. Another pile in the outer ring brought up with by far the easiest penetration of the entire number; so it was subjected to a most rigid test. The pile was 12 feet long, was driven on the 3rd of November and tested on the 21st. It was first loaded to 45 tons, and the load applied for 72 hours; giving under these conditions a settlement of 5-16ths of an inch. Next a load of 60 tons was applied, and at the end of 96 hours the settlement had been ½ inch. After this a final load of 75 tons was applied, and at the end of 120 hours the total settlement had been 23-32nds of an inch. The contractors claim an allowable settlement of ¾ inch with a load of 45 tons; and when it is remembered that the entire load of the holder and water gives an average load per pile of something like 33 tons, it will be readily realized that the factor of safety is great.

The concrete used in the piles and pad was a 1:2:4 mixture. There were used 5,479,075 lbs. of crushed stone, one half of which was employed in the piles and the other half in the pad. The stone for the piles was mixed so that about two-thirds was ¾-inch and one-third 1½-inch; while for the pad approximately two-thirds of the stone used was 1½-inch and one-third ¾-inch. The quantity of sand used was 1490 tons; while the cement totalled 16,200 bags. For reinforcing the pad, 54,870 lbs. of ½-inch rods and 45,913 lbs. of ¾-inch rods were employed. The total length of piles driven was 18,730 feet. The longest pile was 15 ft. 6 in. and the shortest, outside those in the outer ring, was 12 ft. 6 in. Those in the outer row were left below grade, and averaged 11 ft. 6 in. long. The average length of all piles was 13 ft. 9 in., and the average number driven per day was 52·4. This was with two drivers, and gave an average of 20·6 minutes for the complete formation of each pile. The first material arrived at the site on the 20th of October, and driving began on the 27th. The entire foundation required 41 working days to construct; and it was all finished on Dec. 12, 1914.

Mr. Maurice Schwab and Automatic Pressure Lighters.

The business of the Distance Lighting Company, of No. 69, Farringdon Road, E.C., has now been acquired by Mr. Maurice Schwab, under sanction granted by the Board of Trade, and the patent automatic pressure lighters of the Distance Lighting Company will, in future, be made entirely in England with British labour and British material. As to Mr. Schwab, we are informed that he has resided permanently in England for more than forty-four years, and was naturalized as a British subject as far back as the year 1878. With his many years' experience in regard to automatic lighting, and the trained and skilled labour at his disposal, there is no reason to fear that the controllers named above will be in any way inferior to those already in use in this country. We are told that important improvements are contemplated, to make the construction still more reliable.

Mr. A. Morton Fyffe Selected for Blackburn.

Out of 33 candidates for the position of Gas Engineer and Manager to the Blackburn Corporation, in succession to Mr. S. R. Ogden, the Council have appointed Mr. A. Morton Fyffe, who now holds a similar position under the Nelson Corporation, in whose service he has been for the past five years, having succeeded Mr. A. J. Hope about May, 1910. Before going to Nelson, Mr. Fyffe was Chief Assistant to Mr. Alexander Yuill, at Dundee, and while there the works were extended at a cost of upwards of £150,000, and the sale of gas was increased 50 per cent. Since he has been at Nelson, the two gas-works, which are situated about two miles apart, have been entirely reconstructed and extended, in accordance with Mr. Fyffe's scheme, at a cost of £71,720; and the consumption of gas has gone up 35 per cent. He also reorganized the gas undertaking, and instituted a system which allocated to the head of each department the exact duties of his position. He is therefore eminently qualified to carry out at Blackburn the radical changes which the exhaustive inquiry conducted by Sir Corbet Woodall, D.Sc., some months ago showed to be called for. Mr. Fyffe was President of the Eastern District Section of the Scottish Junior Gas Association in 1908-9; was admitted to the Institution of Gas Engineers in 1911, and to the Manchester District Institution in the autumn of the same year; and is also a member of the Institution of Mechanical Engineers. He devoted considerable study to the theoretical aspects of his profession at the St. Andrews University and at the Royal Technical College, Dundee, when he was first prizeman in "Engineering." Referring to Mr. Fyffe's appointment to Nelson, our Scottish correspondent cited it as a further tribute to the good work which was being done by the Junior Gas Association; experience having shown that the holding of the office of President was often followed by the obtaining of a managership. Much satisfaction at Mr. Fyffe's further advance in his profession will be felt in Scotland. He is not yet thirty-four years of age.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Relation between Calorific and Illuminating Values.

SIR,—I have watched with great interest the correspondence and articles bearing on the above-named matter which have appeared from time to time in the columns of the "JOURNAL," and have had the opportunity of studying many figures, and the results of many experiments, which have never appeared in print.

The results of this investigation prompt me to address you; but first allow me to say that I approach this subject not as a scientific investigator (owing to incapacity to act as such) but more as an interested statistician.

There are one or two points to remember in all investigations into sets of figures bearing on this subject. Firstly, it should not be overlooked that the figures published in the Technical Journals as to the Gas Referees results are only averages over many hundreds of readings; and, beyond reflecting in a general way the relationship, they may be presumed to prove too much. The published averages, too, obscure variations in the individual readings. Again, in taking the London Companies' figures, it should be remembered that one of the undertakings makes no water gas, and the percentages differ in the remaining two. As will be shown later, this fact alone prevents any definite conclusion being drawn.

Further, the instruments used in the three series of tests, although all according to prescribed regulations, may differ as to the results they produce; so that we have many instruments on which we are basing our conclusions. The more undertakings we are comparing, the more uncertain do our conclusions become.

Regarding the photometer in general, there is no more unreliable testing apparatus known to the writer than this—probably the most used instrument in this country for official testing purposes. It introduces and depends on the personal element to too great an extent to be of very great scientific value for comparable work. Two observers can obtain considerable variation in the course of a minute or so, and both may be capable.

Taking all these points into consideration, the only manner in which this ratio is to be arrived at should be for one observer to conduct a series of experiments with the same pair of instruments—preferably two giving maximum results for both heating and illuminating values. The tests should then be carried out for straight coal gas, various mixtures, and water gas only.

From a number of experiments which the writer has been privileged to study, the following observations and conclusions seem to be a fair statement of the case.

For straight coal gas manufactured in horizontal retorts the illuminating power and calorific value increase and decrease according to a regular scale; but the ratio between the two is not constant, for gas of no illuminating value whatever has a calorific value of from 340 to 350 B.Th.U. gross. Therefore, the richer the gas, the lower does the ratio become.

The two values then vary as follows: For every candle power added the calorific value increases about 14 B.Th.U. Thus for 14½-candle gas or thereabouts we get the calorific value of 540 B.Th.U. or the ratio of 37 (actually 36·8) adopted by Mr. H. E. Jones, but which is only applicable to gas within (say) a quarter of a candle of this in either direction.

For carburetted water gas manufactured from average water-gas oil and coke from Durham coal, with medium to heavy charges, the rate of comparative variation is the same—*i.e.*, approximately 1 candle to 14 B.Th.U. But gas of the same calorific value has greater candle power by about 5½. Thus 540 B.Th.U. water gas has an illuminating value of a shade over 20 candles, and therefore the ratio becomes in this case 27, as against 37. This rate of comparative variation does not hold good for carburetted water gas of very low candle power.

It is now clear that varying mixtures will seriously affect the ratios for combined gases, and these figures illustrate the fallacy of comparing undertakings making no water gas with those that do.

With regard to mixtures, the proportions worked out arithmetically apply in one way but fail in another. An actual example will make this clear.

Take a 20 per Cent. Mixture.

1 part C.W. gas at 516 B.Th.U.	= 18·6 C.P.	Ratio = 27·8
4 parts coal gas at 516 B.Th.U.	= 13·0 C.P.	Ratio = 39·7
Result 516 B.Th.U.	13·8 C.P.	Ratio = 37 4

This ratio agrees arithmetically—thus:

$$1 \times 27{\cdot}8 = 27{\cdot}8$$
$$4 \times 39{\cdot}7 = 158{\cdot}8$$
$$186{\cdot}6 \div 5 = 37{\cdot}4 \text{ nearly.}$$

But the ratio applied to the candle power does not agree arithmetically—thus:

$$1 \times 18{\cdot}6 = 18\ 6$$
$$4 \times 13{\cdot}0 = 52{\cdot}0$$
$$70{\cdot}6 \div 5 = 14{\cdot}1, \text{ against } 13{\cdot}8 \text{ above.}$$

Thus we see that the mixture loses a little candle power, which is what the chemist finds in most of such mixtures, though not in all. It is further observed that the calorific value can be calculated, and the result will be as expected.

Taking another example:

1 part C.W. gas at	452 B.Th.U.	and 14 candles.	Ratio = 32·3
Five parts coal gas at	516 ,,	and 13 ,,	Ratio = 39·7
	506 ,,	13·1 ,,	Ratio = 38·5

It is easy to see the practical importance of all figures concerning mixtures to those undertakings making the mixed gas. A knowledge of the relationships existing makes the financial aspect of a change in relative illuminating powers or mixtures a matter of comparative simplicity.

Based on an experience of many coals, it is observed from these same experiments that gas of the same illuminating value will contain the same constituents (if the same method of carbonizing is adopted) independently of the description of coal. This is valuable; as, for power users, uniform composition is most desirable.

Regarding Mr. J. G. Newbigging's results from vertical retorts, it would appear that the ratio becomes considerably higher than in horizontals; for according to the experiments reviewed, 12·8-candle gas should have a calorific value of 514 B.Th.U., whereas his figure gives 560·9—a difference large enough to more than compensate for any possible variations in the instruments, and the personal element. So it would appear, on the face of it, that the vertical retorts (or at any rate this particular battery) can give more B.Th.U. per ton of coal than good results from horizontals, although the multiple—make multiplied by candle power—may not be greater. In other words, an undertaking working on a calorific test could do better with verticals than horizontals, other things being equal.

This is drawn attention to in the last paragraph but one of Mr. Newbigging's letter published in your issue of the 16th inst. Regarding the first statement in the same paragraph, it strikes the casual observer as being a quest like that of the Philosopher's Stone.

I may say that the series of experiments on which the various figures in this letter are based was made with a Boys calorimeter, and a bar photometer with the pentane standard and the Carpenter burner (No. 2 Metropolitan).

ENGINEER.

March 25, 1915.

P.S.—In comparing these results with those of the extensive experiments of Mr. Herring in 1906 [see "JOURNAL," July 31, 1906, pp. 317-318], they seem to be in agreement, after allowing 2¼ to 5½ candles for the difference in burners; for the 1906 experiments were conducted with the No. 1 argand. The ratio differs accordingly by 3¼ to 5½—depending on the quality of the gas. Comparing the two series (they are both for straight coal gas), it is observed that the candle powers obtained from the same B.Th.U. vary to a greater extent—and, as a consequence, so does the ratio—as the gas becomes richer.

Alliance and Dublin Consumers' Gas Company.

SIR,—The official copy of the Directors' report and statement of accounts for the half year ended Dec. 31, 1914, has doubtless reached the hands of all stockholders since the beginning of the week. In the light of the recent history of the Company, its reception naturally compels attention, involving comparison with the past. It is not my wish to launch out into any detailed criticism at this stage, but rather, after a first reading, to review briefly the report and the statement of accounts on the basis of the information afforded in such a way that the present may stand co-related with the past.

Primarily, there would appear to be some improvement; but optimism in this respect is somewhat chastened on closer study. For one thing, while much necessary re-arrangement has evidently been taking place during the past twelve months in the general conduct of affairs, re-arrangement has also evidently taken place in the manner of presentation of the accounts, rendering accurate comparison with previous corresponding periods difficult. Doubtless this was done with a view to the stockholders gaining a clearer appreciation of the Company's affairs; but it handicaps criticism on the lines indicated.

To come to a concrete example. In item I., under "Manufacture of Gas," the cost of coal, cannel, coke, and oil has been lumped together, whereas in other years the costs of coal and oil have been kept separate. The new method is not an advantageous introduction, as to those interested in the technical results of gas undertakings informative data are only forthcoming where these big items stand out independent of each other.

My purpose, however, now is not so much to comment in detail, but rather to gauge the situation, as far as it is possible, on broad lines, and, should this letter appear in time, incorporate with my remarks the desire that the Directors should supplement their report with additional information at the approaching half-yearly meeting. This desire is heightened by the fact that, owing to the dangerous condition of the Irish Sea, many stockholders on this side of the water may be unable, for obvious reasons, to be present.

The total amount, then, carried forward to "Profit and Loss Account," or, in other words, the gross profit for the half year, is £53,111 8s. 9d.; but on turning over to the latter account, I find that £8644 18s. has been written off ordinary and prepayment meters, and £8119 17s. transferred to "Special Purposes Fund." Now both these items, together with £69 11s. 3d. income-tax, which I also see included in the "Profit and Loss Account," are generally debited to revenue account, and represent in total £16,834 6s. 3d. Further, I note there is no mention of the £1000 which has hitherto been credited to "Officers' Superannuation Fund."

Again reverting to the "Revenue Account," I find that the expenses under the heading of "Rates and Taxes" show a striking decrease; and I can only conclude that this is due to the omission of income-tax. In previous years, I believe I am right in stating that it was customary to debit the "Revenue Account" with the total income-tax, including that on dividends; the latter being shown net in the "Profit and Loss Account." I have not held that this was the best procedure, but nevertheless, for the present purpose, it is necessary to take cognizance of past practice if we are to gain enlightenment in the present.

From the only source possible to me—the printed accounts—I cull the following figures representing the total expense against "Rates and Taxes" for the three previous corresponding half years:

Dec. 31, 1913	£10,096 9 11
,, 1912	10,222 6 7
,, 1911	10,214 5 2
Total	£30,533 1 8
Average over three years	10,177 13 11

For the half year now ended, the expenditure on "Rates and Taxes" amounted to £4768 5s. 3d.—that is, a diminution of £5409 8s. 8d. over

preceding half years, or taking into account the £69 11s. 3d. income-tax previously noted, the net difference of £5339 17s. 5d.

Summing up the figures brought to light in this commentary, including the £1000 omitted for "Officers' Superannuation Fund," and also the increased revenue of £5818 due to the 2d. increase in the price of gas, we get a total of £28,992 3s. 8d. built up as follows:

Written off ordinary and prepayment meters	£8,644 18 0
Transferred to "Special Purposes Fund"	8,119 17 0
Income-tax	69 11 3
*Officers' Superannuation Fund	1,000 0 0
Reduction on "Rates and Taxes"	5,339 17 5
Revenue due to 2d. increase in the price of gas	5,818 0 0
Total	£28,992 3 8

[* On reference to the half-yearly report for last June, I find this item is £1000 *per annum;* therefore my figures should be read accordingly, £24,119 5s. 1d. to £24,619 5s. 1d.]

Deducted from the gross profit for the half year (£53,111 8s. 9d.), we get £24,119 5s. 1d.; and I invite the Directors' comments on these adjustments, which I consider fair in every essential.

Before closing, I would call attention to two other items that stand out prominently. Firstly, from the figures before me for the sales of gas, as compared with the half year ending 1913, I note that there is a decrease of approximately 4 per cent. Secondly, the leakage or unaccounted-for gas stands at over 12¾ per cent. Finally, in the "Statement of Residual Products," 11,134 tons of coke are shown as having been used, and this presumably includes some portion used in the manufacture of carburetted water gas. I would strongly suggest that the figures be given independently in future, as well as those other items of expenditure in the "Revenue Account" to which I have already referred.

R. W. EDWARDS ["Nonulus"].

Aldershot, March 26, 1915.

Coke-Fuel for Steam-Raising.

SIR,—As the largest makers of special furnaces for burning coke, and other fuels, may we be allowed to confirm the recent letter [*ante*, p. 685] of the expert of the London Coke Committee?

We have for some thirty years fitted several thousands of boilers for burning this fuel at gas-works and elsewhere; and during this period we have never heard of any deleterious effects on the boiler plates. Boilers fitted with our furnaces over twenty-five years ago are still in operation, and working efficiently; and we are, on repeat orders and new work, supplying more furnaces than ever before.

It would be interesting to know what the general working conditions were of the boiler on which Mr. Boot bases his strictures. If the life of this particular boiler was short, does he know that it would have been longer if ordinary fuels had been burnt? There may well have been other reasons.

For MELDRUMS, LTD.
A. BENHAM, London Manager.

Westminster, S.W., March 25, 1915.

[In addition to the reference above, there was comment on the matter in the first paragraph of "Electricity Supply Memoranda" last week, p. 726.—ED. J.G.L.]

REGISTER OF PATENTS.

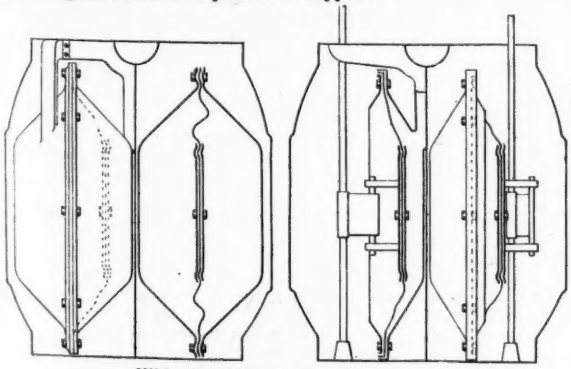
Gas-Meters.

HIBBERD, C. E., of Tooting Bec, London, S.W., and GOAD, F. L., of Edinburgh.

No. 4186; Feb. 18, 1914.

This invention relates particularly to dry meters of the ordinary type having a cylindrical bellows arrangement working in a gas-tight casing forming part of the measuring chamber.

In many cases the capacity of such meters, the patentees point out, is no longer equal to modern requirements; and a main object of the present invention is the provision of a cheap and simple method of modifying such meters, so as to increase their capacity by having a casing divided into compartments, certain of which contain measuring chambers and in association therewith corresponding diaphragms oscillating about a central position of support.



Hibberd and Goad's Dry Gas-Meters.

In carrying the invention into effect according to one form, the outer casing is provided with a horizontal partition to form a gas-tight valve chamber in the upper part, while the lower part of the casing is divided into two compartments by a vertical partition, which (at its upper end it may be) is formed integrally with a semi-circular or other suitably shaped exhaust duct running below the horizontal partition. In each of the two lower compartments a measuring chamber is disposed of the general type shown in patent No. 26,425 of 1909. The essentials of such a measuring chamber consist of a pair of dish-shaped members, between the flanges of which a diaphragm is clamped, so that it is adapted to oscillate about a central position into extreme positions approximately defined by the dish-shaped walls of the measuring chamber. The motion of the diaphragm is conveyed to the meter valves by mechanism of the flag and flag-rod type in the usual manner.

The outermost wall of each measuring chamber may have attached to it a gas-duct of the type shown in patent No. 5647 of 1912—the flange of the duct being preferably vertical and angled as required to correspond with a jointing face formed on the valve-base. The innermost walls of the measuring chambers are likewise connected to the valve-base by a duct, one wall of which is formed by the vertical partition above mentioned, and in some cases also by a portion of the exhaust duct.

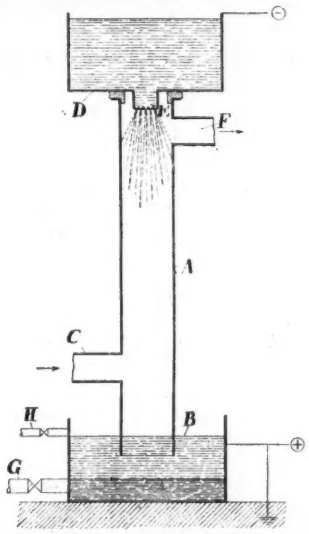
The illustration shows (on the left) a cross section through the casing of a converted meter, one of the internal measuring chambers being also in section; while on the right is shown a modification in which the central portions of the outermost and innermost walls respectively of the internal measuring chambers are removed.

Purification of Illuminating and Heating or Power Gases.

HOWL, E., of Dudley, and PERRY, F., of Tipton.

No. 5051; Feb. 26, 1914.

This invention is to provide for the separation of tar or tar fog and other finely-divided liquid or solid impurities from illuminating and Mond and other producer or power gases, by subjecting the gases to the action of a stream of electro-statically charged particles. The invention further comprises the combination with a vertical tube of a water spray situated at the upper end of the tube and adapted to deliver into the tube a spray of electro-statically charged water particles, which encounter an ascending stream of the gases to be treated; also means for collecting the precipitated matter.



Howl and Perry's Tar-Separator.

For the removal of tar and tar fog from Mond and other illuminating gases, the patentees provide a vertical tube A or tower of metal or other conducting material. At its lower open end is a liquid sump B, for the collection of tarry deposits, and near the end is provided an inlet C for the gases to be treated. At the upper end is mounted an electrically insulated water vessel D, which, at its underside, is provided with jets E, or some device for producing a fine water spray in the tower. Adjacent to it is arranged an outlet F for the purified gases. Electrification of the water receptacle and the spray issuing from it is effected by connecting the receptacle to any source of high-voltage electricity—an influence machine, high-tension dynamo, or induction coil.

It is found, according to the patentees, that in the case of Mond gas to charge the water or other particles negatively is more effective in the precipitation of the suspended tar or tar fog than to charge them positively. For this purpose the tank D is connected to the negative pole, and the base of the tower or the sump B to the positive pole of the electric apparatus.

As the spray passes through the counter-flowing stream of gases it causes the tar particles to coalesce and fall to the bottom of the sump, whence the accumulation can periodically be withdrawn through a pipe G. Water can overflow from the sump through a pipe H.

Manufacture of Illuminating Gas.

COMPAGNIE FRANCAISE DU CENTRE ET DU MIDI POUR L'ECLAIRAGE AU GAZ, of Paris.

No. 4829; Feb. 24, 1914. Convention date, Feb. 24, 1913.

The specification says: "It is well known to use fractional distillation in the manufacturing of illuminating gas, and it is also known to treat the gas by catalysis in order to modify its constitution. It has

been proposed, for instance, to pass coal gas over heated nickel, with or without the addition of hydrogen and oxide of carbon, and thus convert the gas into methane, so as to increase its illuminating power; and it has also been suggested to liquefy part of the gases contained in coal gas and to convert the remaining carbon monoxide and hydrogen into methane by a catalytic reaction with nickel.

"The process of the present invention is intended to increase the candle power as well as the calorific effect of the gas obtained by the distillation of coal, and, moreover, offers an economical mode of operation and a better yield.

"In the distillation of coal, gas of a high lighting power is first formed, together with condensable vapours; and then gas is produced the candle and heat effect of which is low.

"The process consists in collecting the hydrocarbons with a high lighting power separately and subsequently treating by catalysis the second fraction of distillation—*i.e.*, the gases that do not illuminate and have a feeble calorific effect. The rich gases given off at the beginning are, if necessary, brought to the usual calorific power by admixture with CO and H_2 produced either in a separate gas-generator or in the retort, chamber, or oven itself, by the introduction of water vapour.

"The second fraction, which consists mainly of poorer gases such as CH_4 and H_2 and CO, is mixed with suitable proportions of CO and H_2 produced as stated, and is treated directly by catalysis, without undergoing preliminary heating to a high temperature, for the purpose of depositing carbon and after a simple purification by washing and separation of sulphur. This catalytic process consists in passing the gases over heated metallic nickel, so as to convert these gases into gas of high calorific effect (methane). This gas is then mixed with the hydrocarbons collected at the beginning—*i.e.*, of the first fraction—and a gas of better quality is thus obtained that has a higher candle power and calorific effect than in the case of the usual processes.

"The condensable vapours distilled in the first fraction can, moreover, be converted into gas of very good quality by passing same through a chamber lined with bricks of fire-clay or other refractory material and heated to red heat, whereupon the gas obtained in this manner is mixed with the other gases.

"This process has the advantage, moreover, of enabling gas of a definite calorific effect to be manufactured under working conditions that may vary to a large extent, and of using various kinds of coal. A maximum yield of the coal used as raw material is thus obtained, together with the highest candle power and calorific effect."

Manufacture of Lime and Gas.

PEARSON, R., of Redcross Street, and the CHALK FUEL POWER GAS AND BYE-PRODUCTS CORPORATION, LIMITED, of Cannon Street, E.C.

No. 5734; March 6, 1914.

This invention, relating to "a methodical process for the manufacture of lime and simultaneously fuel gas," is founded on a process described in patents 3347 and 10,624 of 1903.

In order to render the invention "as economically successful as possible," the patentees say they prefer to use in the process chalk briquettes, made according to patents No. 6981 of 1912, and No. 7643 of 1913—namely, chalk, small coal, solidified tar, and naphtha oil mixed together and subjected to steam; the chalk being broken or reduced to powder. The broken or powdered chalk, in the proportions of preferably about 75 per cent., is then put into a mixer, and 12½ per cent. of solidified tar, 10 per cent. of a carbonaceous substance (such as small coal), and 2½ per cent. of crude oil (such as naphtha oil or petroleum) are added; the whole being subjected to steam in the mixer. The materials are then thoroughly mixed together until they become one homogeneous mass; and after being subjected to steam, the mixture is "ready to be moulded into the shape which is most suitable for introduction into the gas-generator in which the briquettes are intended to be used. It is preferred that the briquettes should be of such a form—preferably ovoid—that the hot air and carbon dioxide shall have free access to the greater part of their surface.

In starting the process, there is fed into the generator a bed of carbonaceous fuel from (say) 18 inches to 2 feet in thickness, which is then lighted and blown-up to a good incandescence. The briquettes are then fed in, and "give off a rich hydrocarbon gas." This gas is mixed with the steam derived from the moisture contained in the chalk briquettes and the first carbon dioxide coming off the chalk, *plus* the carbon dioxide of the combustion of the carbonaceous fuel, *plus* the nitrogen from the air blown through the bed of carbonaceous fuel. The carbonaceous fuel or small coal in the briquettes, within a short time of the starting of the process, become incandescent, and the liberated hot carbon dioxide from the chalk, *plus* the hot water from the moisture of the chalk, coming into contact with the incandescent carbon, splits up into CO + H + N + a small quantity of carbon dioxide; and this is all mixed with the rich hydrocarbon gases of the heated solidified tar, and makes "a very rich gas suitable for lighting or heating, for use in internal combustion motors, and for other like purposes."

Regenerator Settings for Vertical Retorts.

GLOVER, SAMUEL, of St. Helens, and WEST, JOHN, of Southport.

No. 7757; March 27, 1914.

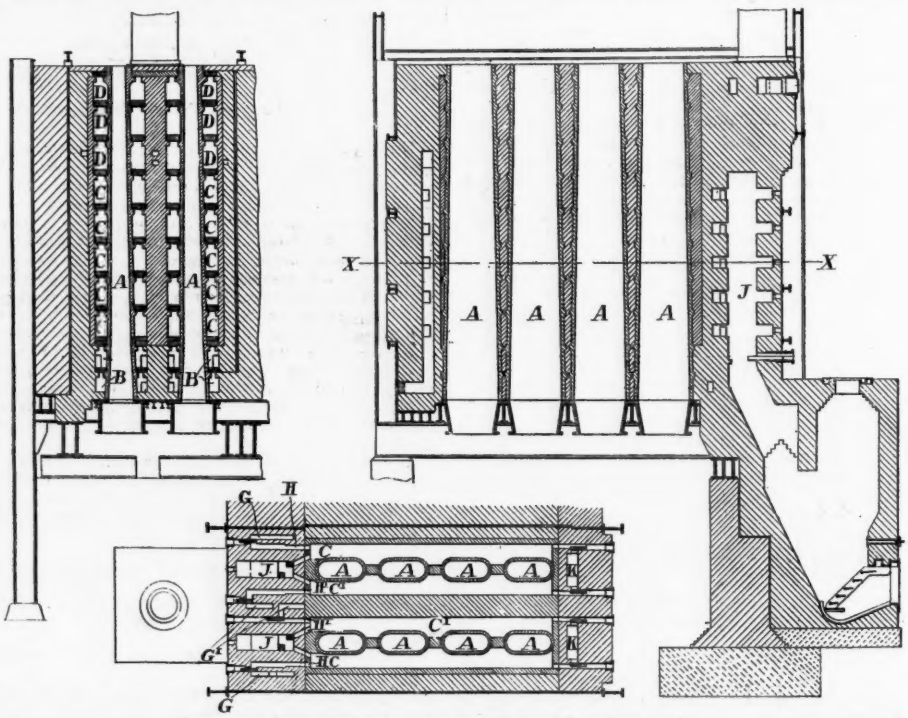
This invention relates to regenerator settings of vertical retorts of the type in which a plurality of separate or independent horizontal air-heating and combustion chambers are arranged around the retorts; and it has for its object to provide for a "more uniform and efficient heating" of the coal during the carbonizing process "with economy of fuel," and for the "more uniform cooling of the lower ends of the retorts."

The illustration shows a sectional elevation of a retort-setting arranged in accordance with the invention; also a cross sectional view, and a sectional plan on the line X. The retorts A pass through horizontal chambers B, C, D, the two lower rows B of which serve for heating the secondary air required for combustion in the combustion chambers C, and the upper rows D receiving the waste gases from the combustion chambers and circulating it round the upper ends of the retorts to utilize the heat contained in the gases.

Each horizontal chamber around a row of vertical retorts is divided into two compartments; and the gases are caused to travel in parallel streams through them. In the case of the lower chamber B the retorts have independent and non-communicating compartments at each side; each receiving a separate supply of cold air, while each compartment of the upper chamber receives a separate supply of partially heated air from the chamber beneath. The heated secondary air then travels to vertical conduits G G^1, which transfer it to the several combustion chambers C.

Each of the combustion chambers is similarly divided into two compartments C C^1, which receive independent supplies of heated secondary air and gas from the ports H H^1 and I I^1; the air travelling up the vertical conduits G G^1 and the gas up the conduits J. Thus the products of combustion travel in parallel streams through the adjacent compartments, and "the heating of the opposite sides of the retorts is therefore practically uniform."

From the combustion chambers C, the products of combustion pass by way of the vertical flues K to the lowest of the three circulating chambers D. The gases issuing from ports in these chambers (each of which is divided into two compartments) receive a supplementary



Glover and West's Regenerator Setting for Vertical Retorts.

supply of heated secondary air from the vertical conduits G G^1, so as to ensure the complete combustion of any unburnt gases which may pass into them from the combustion chambers. From the lowest row of chambers D (the supplementary combustion chambers) the gases travel to the row above by way of openings and so on to the base of the chimney, which is divided by a division-piece for some distance up, so as to equalize the draught in the chambers communicating with the two sides of the division-piece.

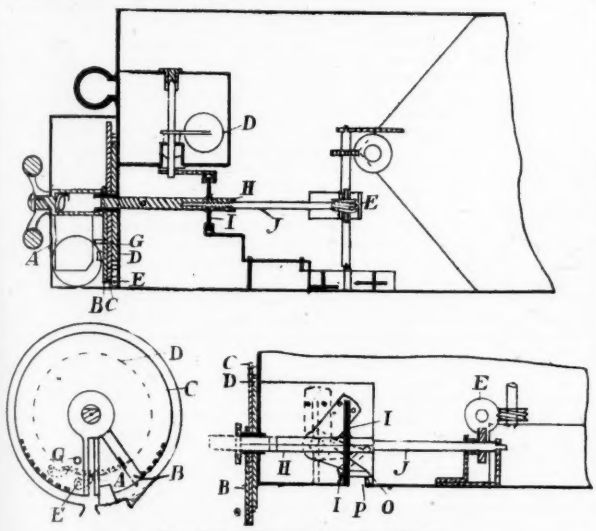
It will be noticed that the air and gases travel in the same direction in two parallel streams on opposite sides of the retorts, thereby ensuring not only more uniform heating or cooling of the contents of the retorts, and therefore a more uniform travel of the contents down the retorts with greater efficiency of carbonization, but a reduction of the initial temperatures in the combustion chambers, and thus obtaining "economy of fuel and an increased life of plant."

Prepayment Gas-Meter Mechanism.

HANSFORD, J., and the HANSFORD METER COMPANY, LIMITED, of New Southgate, N.

No. 12,441; May 20, 1914.

This invention is said to relate to "a simpler and more effective method of obtaining a wider and easier change of range than has hitherto been obtained by similar mechanism."



Hansford's Prepayment Gas-Meter.

The illustrations are: A sectional plan; a sectional elevation of the coin-guide, chamber, and change disc, showing (in dotted lines) the ratchet wheel and pawls with false coin escape and curved recess; also a sectional elevation showing the method adapted to connect the valve to the index-shaft and the pin hole used to disconnect the coin-freed mechanism from that of the ordinary meter.

The manner in which the meter operates is as follows: The coin being inserted through a slot of the main chamber is held in position by the coin carrier A; the outside handle being rotated in the forward movement. The coin resting on the bottom of the curved recess shown is brought into the actuating line of the coin chamber, and then engages with a raised pin of the price changer B, which is held in the predetermined position by a notch of the change disc C, corresponding to the current price of gas. The pawl E, attached to the change disc, engages the ratchet wheel D, causing it to rotate the determined distance until it meets a stop, when the coin falls into the money box. During this action, the sliding sleeve H has revolved on the screw J, the disc I of the sleeve making a contact with a lever pin and opening the valve O, so as to allow gas to flow through the seating P to the measuring chamber of the meter. This action being set in motion, the valve crank revolves, actuating a worm which (being engaged with the index wheel) rotates the checking worm L, revolving the spindle J and attached wheel, the screw of which draws the sleeve H towards its former position, when the disc I, moving in contact with the lever pin, closes the valve O on the seating, shutting off the supply of gas to the measuring chambers.

After the operating coin has been discharged, the handle is rotated in the backward movement, the coin carrier A making contact with the pin G, and rotating the disc C with the pawl E and the price changer B to its former position, to receive another coin if so desired.

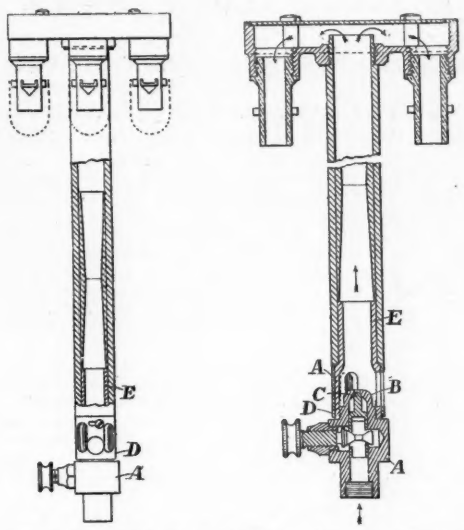
To use the meter as an ordinary meter, it is only necessary to remove the cover, to which is attached the coin slot and coin carrier, also the change disc price changer and ratchet wheel; revolve the sliding sleeve H until disengaged from the screw of J; replace the ratchet wheel D with the change disc I, insert the pin in the hole of H, thus keeping the sleeve H disconnected from the checking screw J. The disc I of the sleeve H, being in contact with the pin and valve O, is kept open in the position to ensure a full way of gas.

Incandescent Inverted Cluster Burners.

WELSBACH LIGHT COMPANY, LIMITED, and BARFORD, A. R., of Gray's Inn Road, W.C.

No. 8913; April 8, 1914.

This invention relates to incandescent inverted cluster burners of the preheating or regenerative type, primarily designed for street lighting.



Barford's (Welsbach Light Company) Cluster Burner.

The illustration shows a side elevation of a four-light cluster burner, and a vertical transverse section.

The head of the burner is formed of a closed metallic chamber with the top removably held in place by screw studs, so as to give access to the interior for cleaning purposes. On the underside of the chamber constituting the head of the burner is arranged a cluster of tubular inverted mantle nozzles depending from sockets projecting from the bottom of the chamber, so that the flames heat the burner head, making it a "regenerating chamber."

The burner chamber is supported by a central tubular stem, the bore of which is formed with a constriction having somewhat the shape of a "*vena contracta*" upon the principle of the well-known Kern burner. At the lower end of the stem is a fitting A, provided with a gas nipple or injector B and regulating valve C, of ordinary construction, and air inlets controlled by the usual rotary valve D. Above the air inlets the fitting is formed with a tubular spigot E, and the lower end of the stem forms a collar so that it removably fits on to the spigot of the fitting.

The burner may thus be revolved upon the spigot as an axis to facilitate the renewal or manipulation of the mantles, so that ready access to all the mantles may be had without the attendant altering his position; while the burner may be lifted off the spigot to give free access to the nipple or injector for cleaning or other purposes.

APPLICATIONS FOR LETTERS PATENT.

4071.—BUCKLEY, C. A. M., and WHITFIELD, R. C. V. "Gas-producers." March 15.

4124.—CHANDON, F. M., "Acetylene-generator." March 16.

4126.—DAVIS, H. N., and TWIGG, W. R., "Air-blast burners." March 16.

4130.—EBERHARDT, A. C., and SHORT, E. A., "Interchangeable gas and electric light fittings." March 16.

4142.—SCHAUERMANN, F. L., "Manufacture of fire-brick." March 16.

4155.—WOLF, C. R., "Water supply installations." March 16.

4240.—MOTTRAM, G. W., "Introducing gases into intimate contact with liquids." March 18.

4264.—CLIMIE, W., JUN., and LEAS, W., "Treatment of gas." March 18.

4280.—RASCH, L., "Pilot-lights." March 18.

4393.—TOOLEY, F. E. M., "Retort-charging apparatus." March 20.

Metropolitan Water Board's Deficiency.—On the motion for the adoption of the annual estimates at the last meeting of the Metropolitan Water Board, Sir Melvill Beachcroft pointed out that there was an estimated deficiency of £145,000; but of this £55,000 was attributed to the increase in wages and the war bonus which the Board were proposing to give to employees.

Loans for Completed Works.—The following remarks on this subject have appeared in the "Municipal Journal": "Local authorities which may have contracted the bad habit of carrying out works before the loan sanctions have been obtained should take warning from the sad case of the Okehampton Town Council, which applied for leave to borrow £106 'for works of water supply.' The usual Local Government Board inquiry having been held, there came to hand a few days ago a letter containing the following paragraph: 'The Board learn from this report [of the Inspector] that all the works have been completed for some time; and they direct me to state that, having regard to the necessity for avoiding, as far as possible, at the present time, the borrowing of money by local authorities, they do not see how they can sanction a loan in this case.' The Okehampton Town Council decided to 'try and induce the Board to alter its decision;' but what will happen if the Board refuses? Seeing that the borrowing or non-borrowing of a hundred pounds by Okehampton is unlikely to affect the successful prosecution of the war, it appears to us that the Local Government Board desires to make an example for the benefit, or otherwise, of large offenders."

MISCELLANEOUS NEWS.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The report for the half year ended Dec. 31, to be submitted to the proprietors at the meeting to be held at the offices, D'Olier Street, Dublin, to-morrow (Wednesday), states that the total revenue was £160,249, and that the expenditure, including interest on debenture stock and temporary loans, &c., amounted to £116,381, showing a profit of £43,868. Out of this, the Board have appropriated a sum of £8645 in reduction of the amount standing in the capital account for ordinary and prepayment meters, and a contribution of 10s. per cent. on the paid-up capital of the Company to the special purposes fund, which will amount to £8120. This leaves a balance of £27,103, to which must be added the sum of £4440 brought from last account, making a total of £31,543. The Directors are gratified at the satisfactory results obtained.

Owing to the exceptional difficulty in obtaining adequate supplies of coal, occasioned by the war, and the uncertainty as to further increases in the price of coal and other materials which may be demanded in the near future, the Directors cannot, on the present occasion, recommend payment of a dividend on the consolidated ordinary stock at a higher rate than 2½ per cent. per annum. This dividend, after deduction of income-tax, will absorb a sum of £17,782, after which a balance of £13,761 will remain to be carried to the next account.

The Directors regret to announce the resignation, since the last half-yearly meeting, of Mr. Francis T. Cotton, as Secretary and Manager of the Company. They have appointed Mr. William J. Grey (Associate of the Institute of Chartered Accountants in England and Wales) as Secretary and Accountant; and a resolution will be submitted fixing his remuneration.

In the revenue account, the receipts were: Sales of gas (after deducting discounts), £118,876; meter and stove rents, £11,819; residual products, £26,905; and miscellaneous receipts, £2648. The items on the expenditure side were: Manufacture, £71,236; distribution, £21,378; public lamps, £769; rent, rates, and taxes, £6130; management, £6684; and miscellaneous and special charges, £942. This left a balance of £53,111 to be carried to profit and loss account. The quantity of gas made was 810,120,000 cubic feet, including 259,415,000 cubic feet of carburetted water gas. The quantities sold were: Public lighting, 44,382,000 cubic feet; private lights per meter, 653,891,000 cubic feet; total sold, 698,273,000 cubic feet. The quantity used on the works, &c., was 12,147,000 feet; the total quantity accounted for, 710,420,000 feet; and the quantity not accounted for, 99,700,000 feet. The number of public lights is given at 6444.

AUSTRALIAN GASLIGHT COMPANY.

The Half-Yearly Meeting of the Company was held at the Royal Exchange, Sydney, N.S.W., on Monday, the 8th ult.—Mr. G. J. COHEN (the Chairman) presiding over a large gathering.

The SECRETARY (Mr. R. J. Lukey) having read the notice convening the meeting, the report of the Directors was taken as read. This stated that the profits for the six months ended Dec. 31 (including the balance brought forward) amounted to £64,242, out of which the Directors recommended the payment of a dividend for the half year at the rate of 7 per cent. per annum on the "A," "B," and "C" shares, which would absorb £53,550, and leave a balance of £10,692 to be carried forward. The Board regretted that, owing to the increased cost of coal and other extra expenditure, they had not been able to make sufficient provision for depreciation and renewals of plant this half year. They regretted also the necessity of recommending a reduction in the rate of dividend on the "A" and "B" shares. The price of gas was, on Aug. 28, increased to 3s. 10d. per 1000 cubic feet; but the "Necessary Commodities Control Commission" having, on Sept. 17, declared the maximum price to be 3s. 6d. per 1000 cubic feet, this rate was reverted to until Nov. 14, when it was again raised to 3s. 10d.—the Commission having, after full inquiry, recommended the increase. The extension of the Company's mains to Bankstown having been completed, the public lighting of this Municipality was installed on Jan. 1. The Directors recorded, with deep regret, the death of Mr. Thomas J. Bush (the Company's Engineer), which took place in London on Sept. 23. He had occupied his position for 36 years, during which period he greatly assisted in the development of the Company's business.

The CHAIRMAN, in moving the adoption of the report, said: In presenting the statement of accounts for the half year, I regret they are not as favourable as usual. The outbreak of war in August last seriously interfered with the Company's operations; and it was thought advisable at the time to stop all shipments from England, on account of the liability of vessels to seizure by the enemy, and the greatly increased premiums for war risk. Happily, however, a much more satisfactory condition of affairs exists to-day, thanks to the British Navy, in which our own ships have taken no insignificant a part, in assisting the Mother Country to keep the trade routes clear. After due consideration, our London agents were, in November, instructed to resume shipments; and they are now coming on uninterruptedly.

THE PRICE OF GAS.

But this has not been our only anxiety; for, in consequence of the greatly enhanced cost of coal, owing to the continued "afternoon shift" strike at Maitland, the increased cost of labour, and the additional Federal and State taxation, the Company, to meet their expenditure and to provide for future contingencies in the way of depreciation, renewals, and repairs, which are always considerable and continuous, found it expedient, on Aug. 28, to raise the price of gas to 3s. 10d. per 1000 cubic feet. After notification of the increase had been given, the Necessary Commodities Control Act, 1914, came into force; and the Government, on the recommendation of the Commission appointed under the Act, reduced the price to the standard rate of 3s. 6d. per 1000 cubic feet. But against this the Company appealed; and, after a lengthy inquiry, the Commission agreed to the increase, which was ultimately confirmed by the Government—the new rate being re-instated on Nov. 14. The Directors regret having to make this increase. But "necessity knows no law;" and the consumers may rest assured that the Board will be only too happy to return to the standard rate when practicable.

QUESTIONS OF QUALITY AND COAL SUPPLY.

The Company were called upon to meet another inquiry regarding the quality of the gas supplied during the exceptionally trying period they were then passing through, which I considered, and still think, should not have been questioned, under the circumstances. However, I am pleased to say that the information against the Company was dismissed. I regret the trouble at the Pelaw Main Colliery has not been settled, but am hoping that the conference now taking place between the proprietors of the mine and the miners will result in a settlement of this long dispute, and that normal conditions regarding the supply of coal will be resumed.

INCREASED GAS CONSUMPTION AND EXTENSIONS.

The increase in the consumption of gas has been well maintained during the past six months, and would doubtless have been greater, but for the serious interruption to the Company's business already alluded to. This is all the more gratifying, in face of the competition of the electric light, which is now so vigorously being carried on in the greater portion of the area covered by the Company's mains. The rising and important suburb of Bankstown was supplied with gas at the commencement of this year. It was fortunate that the extensions were well in hand before war was declared; otherwise there would have been considerable delay in completing them. The extensive works at Mortlake are being pushed on with as much speed as possible. The tank for the new gasholder is practically finished, and progress is being made with the holder itself. But it cannot be in operation for at least another year. No. 3 retort-house has been completed; and the contractors are getting on well with the construction of No. 4 house. Both are provided with vertical retorts. The laying of the 36-inch main is nearing completion; and the new buildings necessitated by the closing of the Head Station are well advanced. I cannot report definite action towards a settlement by the Government in connection with the resumption of the Head Station. Experts are busy preparing evidence on behalf of the Company; and the case is likely shortly to come before the Courts.

FINANCIAL MATTERS.

In the present disturbed state of the Money Market, the Directors thought it desirable not to have so much of the loan money at call. Consequently second debentures were issued, to be known as "B" debentures, to the amount of £500,000, having a currency of five years, and bearing interest at the rate of 5 per cent. per annum. These, I am pleased to say, have all been taken up. The unusually large amount of temporary loans is mainly occasioned by having to provide for the replacement of the Head Station works at Mortlake, towards which the Company have so far been unable to obtain any advance from the Government. I may state also that the Company have during the past twelve months had to pay away a large amount for interest on borrowed money expended on the extensions at Mortlake not yet completed, and for which we are not, so far, receiving any return. I hope that when we meet you in July a good portion of the new plant will be in use.

OFFICIAL CHANGES.

The death of our late Engineer, Mr. Thomas J. Bush, in London, last September, was a great loss to the Company. He had been in ill-health for some considerable time, and unable to give his usual close attention to the Company's affairs. During the 36 years he held the position, he carried out his duties with great ability and success. The services of Mr. P. C. Holmes Hunt, of Melbourne, formerly Engineer of the Metropolitan Gas Company, have been temporarily retained as Consulting Engineer. He will also give his assistance in connection with the extensions now in course of progress. The retirement from the Board of Mr. C. H. Myles on account of failing health, after occupying the position for nearly 39 years, is much regretted. The services always given were much appreciated by the Board; and on his retirement, he carried with him the best wishes of his late colleagues.

THE ACCOUNTS.

With regard to the accounts, I may say that the quantity of gas sold during the six months under review was 2,046,502,000 cubic feet—an increase of nearly 10 per cent. over the corresponding period of last year. The day consumption continues very satisfactory; being equal to 52·8 per cent. of the total gas sold. The public lamps, as is natural, owing to the present desire of municipal councils to adopt electricity for street lighting, show a decrease of 206 for the half year; the number at present in use being 7714. In this connection, it is very gratifying to the Directors that the councils are not showing any antipathy to the Company; the relationship to one another being as cordial as formerly. In fact, in two instances, resolutions of thanks for the manner in which the Company have carried out their duties to the councils, and at the same time expressing best wishes for the Company's continued prosperity, have been received. The sale of gas-cookers has been somewhat interfered with through cessation of shipments; but notwithstanding this, 1950 were disposed of in the half year—the number sold to date by the Company being 38,700. The present number of consumers is 123,740, showing an increase of 3892 during the six months. The increase in mileage of mains and services laid was 86 miles; the length laid now being equal to 3164 miles.

Mr. P. T. TAYLOR (Deputy-Chairman) seconded the motion for the adoption of the report and the payment of the dividend recommended; and it was carried unanimously.

The Directors and officers were heartily thanked for their services during the past half year.

MELBOURNE METROPOLITAN GAS COMPANY.

The Seventy-Fourth Half-Yearly Meeting of the Company was held in Melbourne on Thursday, Jan. 28—under the presidency of Mr. JOHN GRICE (the Chairman).

The MANAGER and SECRETARY (Mr. John Hinde) read the notice convening the meeting; and the report and accounts were taken as read. The report stated that the net profits for the half year ended Dec. 31 (including a balance of £70,675 brought forward) amounted to £185,379. From this sum, the Directors had made the following transfers: Reserve fund, £25,000; meter renewal fund, £3000; gas-stoves, &c., account, £5000; capital account, £63,336. They recommended the payment of a dividend at the rate of 6s. 6d. per share, which would leave a balance of £30,075 to be carried forward.

The CHAIRMAN, in moving the adoption of the report and accounts, said he would first refer to the operations of the Company for the full year 1914. The quantity of gas sold was 2,794,219,000 cubic feet, as compared with 2,589,840,000 feet in 1913, or an increase of 7·89 per cent. The number of meters fixed as at Dec. 31 was 140,505 (114,603 ordinary and 25,902 prepayment), which was 8201 more than at the end of 1913. During the past year, there was a net gain of 10,092 in the number of stoves in use; and in the twelve months 984 bath-heaters and 2169 gas-fires were placed, together with a number of gas-irons and wash-coppers.

THE HALF-YEAR'S FIGURES.

Proceeding then to deal with the past half year, the Chairman said: The receipts from the sale of gas for the half year showed an increase of £19,866 in comparison with the corresponding period of 1913. Residuals, however, which were even more susceptible than gas to outside influences, showed decreased receipts of £5140. Coke and tar, with a lessened return of £7000, were responsible for this result. On the other hand, sulphate of ammonia was better by £1873. In dealing with the profits of the half year, the Directors had written-off from net revenue the cost of a quantity of plant certified to by the Engineer as useless, amounting to £63,336, and so reducing the expenditure side of the capital account by a corresponding figure.

MAINS, ETC.

During the half year, 28 miles of mains and 85½ miles of services were laid, at a total cost of £30,095. In addition to this, 3 miles of high-pressure main were laid in completion of the main from the Tooronga holder to East Camberwell. The benefit of the main was immediately apparent in the improved pressures over the area affected; and consumers in the district had now an efficient supply.

SPECIAL CONTRIBUTIONS, ETC.

A contribution of £1000 had been made (in equal proportions) to the Patriotic and Red Cross Funds; and he was sure in so disposing of these sums out of the profits of the Company the Board had merely anticipated the wishes of the shareholders. It was pleasing, also, to record the fact that a number of employees of the Company, recognizing the duty of patriotic eligible male citizens, had joined the Expeditionary Forces. In respect to these men, the Company were making up to their dependants the difference between the military pay and the rate they were receiving in the Company's service, and we feel sure that you will heartily approve of such action. Together with all who took a sympathetic and practical interest in the well-being of the working classes, the Directors deplored the combined effects of the war and the drought upon the industries of the Commonwealth, and the consequent increasing amount of unemployment occasioned. The depression was already affecting the Company's operations, inasmuch as the restricted number of new buildings was reducing the demands upon expenditure for extension of mains and services and new meters. This condition of affairs would probably become more pronounced in the near future; but notwithstanding the Company had not reduced the number of their employees. While the Board could give no undertaking as to the future, they would do all they could to find work for those of the employees who co-operated with them in giving loyal and zealous service. By doing this, and in endeavouring by all means to prevent unemployment, they helped their own large number of employees in these trying times, and would be best doing their duty to the community at large, and be acting as the proprietors would wish.

ISSUE OF SHARES AND DEBENTURES.

The Directors had effected the sale by auction of 10,000 additional new £5 shares, and had taken steps to raise a further sum of £50,000 upon debentures. The sale took place on Dec. 15; and under keen competition the shares were all disposed of at an average price of £9 16s. 9d. each—a satisfactory transaction. The debenture issue, bearing 5 per cent. interest, was disposed of at £99; and the bonds were for varying terms of three, four, and five years, at the option of the purchaser.

HIGH-PRESSURE PUBLIC LIGHTING.

The shareholders were aware that a contract had been entered into with the St. Kilda Council for lighting several leading thoroughfares in the city with high-pressure gas—the most modern form of street lighting. During the half year, the work of laying down the special supply mains and erecting the compressor and lamps was completed, and the plant started to work in October. The installation consisted of three 4500-candle power, fifteen 1500-candle power, and forty 1000-candle power lamps—a total illuminating power of 76,000 candles. The new system of street lighting had more than come up to expectations. The official opening of the installation took place on Nov. 20, when a number of St. Kilda councillors, together with the Directors, inspected the lighting.* The councillors were very favourably impressed, and expressed themselves as pleased at being the first municipal authority to introduce the new system of street lighting into Melbourne. It was hoped municipal authorities, recognizing its superiority over other forms of public lighting, would considerably extend the system.

GAS AMENDING BILL.

A Bill for the purpose of amending the Charter of the Company was introduced into the Legislative Assembly towards the close of the parliamentary session in October last; but as there was not sufficient time for its consideration, it was shelved. The Bill had for its main objects the revision of the standard price of gas and sliding-scale, the standard rate of dividend, an alteration in the method of testing the gas supplied by the Company, a variation in the basis of reserve funds, and the substitution of a scheme permitting the municipalities to purchase the Company's undertaking by arbitration, in lieu of the terms under which, by the existing Act, the municipalities were entitled to acquire the undertaking on the payment by them of eighteen times the average net profits of the three years preceding the transaction. Some of the proposed provisions were in the opinion of the Directors inequitable, and opposed to the shareholders' interests; and Parliament was accordingly petitioned for leave to appear by Counsel at the Bar of the House to submit their views on the matter. Leave was granted; and Sir William Irvine, K.C., and Mr. Starke attended the sittings of the Legislative Assembly on Oct. 20. Sir W. H. Irvine urged upon the members the necessity for an amendment of the Bill, so as to modify those clauses which appeared to be of an objectionable character. Sir William Irvine placed the true position in an able and clear way before the House of Assembly, though he was only able in the short time at his disposal to deal with the principal objections to the Bill.

THE COMPANY'S ATTITUDE.

In briefly explaining the attitude taken up by the Board in respect to the Government's proposals, the Chairman said: The inherent right of Parliament to alter or amend any Act is admitted. In the interest of all concerned, such alterations as will have the effect of bringing the operations of the Company more into line with modern conditions and requirements of the gas industry are desirable; but the principle has been laid down and recognized at all times by British legislation that, where a Charter or Act of Parliament has been granted to any company conferring rights and privileges, no interference with, or confiscation of, these shall take place, unless legislation of that character is justified by the improper use of such rights and privileges, or unless adequate compensation is paid to those who may be affected by such interference. As no such compensation is proposed, your Directors have entered, and must enter, a strong protest on your behalf against any unfair curtailment of the privileges which shareholders are entitled to under our present Act. And this protest ought to have the strong support of all investors; for should the principle of taking away rights without compensation under an Act on the faith of which money has been provided, be accepted, such an interference with rights will not stop at the Metropolitan Gas Company. In the present instance, Counsel pointed out to the House, it has not been proved that the Metropolitan Gas Company have, at any time, committed any breach of their Charter; and he stated that Parliament, therefore, has no right to deprive shareholders of their existing privileges without proper compensation.

MAIN PRINCIPLES OF THE BILL.

The main principles of the Bill introduced into Parliament are as follows: Under our present Act, the standard price of gas is 7s. and the standard rate of dividend 10 per cent.; and for every reduction of five farthings in the price of gas, the Company are entitled to increase their dividend by ½ per cent. per annum. On this basis, the shareholders were entitled, before the recent new issue, with gas at its present price of 4s. 4½d. per 1000 cubic feet, to distribute a dividend of 22½ per cent. per annum, equivalent to £192,872; whereas the amount distributed as dividend was only £111,437 per annum. The Government's proposal was to reduce the standard price of gas to 4s., and the standard rate of dividend to 8½ per cent. per annum, with the right to increase the dividend by one-quarter per cent. per annum for every 1d. reduction in the price of gas. It proposed, however, to permit the Company to distribute *pro ratâ* among existing shareholders in new shares the sum of £466,535, the then amount of the Company's premium capital. Now, 8½ per cent. on the increased amount of capital would be about equivalent to the present dividend of 13 per cent. on the paid-up share capital of £857,210; but this dividend was only payable if we sold gas at 4s. per 1000 cubic feet. With gas continuing to be sold at 4s. 4½d. per 1000 cubic feet, your Directors would have been compelled to reduce the dividend to 7½ per cent., thereby decreasing the amount of dividend which was then being divided among the shareholders by £15,400 per annum. We submitted through Counsel to the House, and we still maintain, that to thus deprive shareholders of their existing dividends to the amount named, and to decrease the value of their shares by something like 14 or 15 per cent., would be unjustifiable. Counsel submitted to the House, also, our view that a more equitable basis for the standard price and sliding-scale would be 4s. per 1000 cubic feet, and a standard dividend of 10 per cent. on the increased capital. Had the Government adopted these figures, there would have been no interference with the amount of the existing dividend of 13 per cent. upon the original capital of the Company, with gas at 4s. 4½d. per 1000 cubic feet, though we should still be sacrificing the right we have to pay a dividend of 22½ per cent., with gas at the price named. Or, what is still more important, we are giving up the right that we now have to maintain our present dividend, should exceptional circumstances—such as higher coal or freight or wages—compel us, against our wish, to increase the price. It is practically almost the universal method in Great Britain, in dealing with the standard price of any gas company, to fix it at a figure higher than the then selling price. This tends to encourage the more economical management of the concern, so as to enable reductions in the selling price of gas to be made from time to time, with the corresponding advantage of increased dividends to shareholders. The Amending Bill further proposed to repeal section 133 of our Act, which permits the creation of a reserve fund equal in total amount to one-eighth of the combined paid-up capital of the Company and the amount of the debenture indebtedness; and annual contributions to this fund from the profits of the Company not exceeding 3 per cent. upon such capital

* An illustrated account of the installation here referred to appeared in the "JOURNAL" for Jan. 19, p. 132.

may be made. This fund, under the provisions of the section referred to, may be utilized in various ways in the interests of the undertaking, including the provision of plant and the improvement and extension of the Company's works In place of this reserve fund, it is proposed to permit of the creation of a special purposes fund by yearly appropriations out of the revenue of the Company of 2½ per cent. upon the combined paid-up capital and debenture capital; to restrict the maximum amount of such fund to one-tenth part of the combined capital; but to limit its application to expenses incurred by reason of accidents, strikes, or circumstances which due care and management could not have prevented, or for expenses incurred in the replacement or the removal of plant or works other than expenses requisite for the maintenance and renewal of plant and works. The present test for illuminating power of the gas is proposed to be abolished, and a test for calorific value to be substituted. Inasmuch as the new test is on the lines of that adopted in the most modern legislation in Great Britain, your Directors are offering no objection to this alteration of the existing Act. At present we have the right to carry forward from year to year an unlimited amount of profits, which may at any time be utilized for the legitimate purposes of the undertaking. The Bill proposes to restrict this carry-forward to an amount equal to one year's dividend at the standard rate. With regard to the proposed alteration in the basis of purchase of the undertaking by the municipalities, it will be remembered that exception was taken to the provisions of our present Act when dealing with this matter, on the grounds of their ambiguity, and what was considered to be the excessive amount which the municipalities would have to pay to acquire the undertaking. We are offering no objection, therefore, to the inclusion of the Government's clause which provides that the amount of the purchase-money may be agreed upon between the Company and the local authorities, or, failing such agreement, upon the amount of the purchase-money and the terms and conditions of the purchase being determined by the arbitration of a judge of the Supreme Court, assisted by two assessors. The Bill provides also for increases in the capital of the Company; and it included the right to the Company to acquire and utilize land outside the area of supply. This is a necessary provision, in view of the difficulty of securing a suitable site within the Company's present boundaries for the erection of additional plant to provide for the necessary demands of the public for gas.

THE SHAREHOLDERS.

The Directors feel satisfied that when once members of Parliament fully realize the fact that an injustice will be inflicted upon the shareholders of the Company if the Bill becomes law in its present form, it will be found that the members of the Legislative Assembly will agree to the necessary amendments being made, so as to protect those rights which were conferred by Parliament itself. In dealing with the affairs of the Company, it must not be forgotten that the share list is made up mainly of small investors, who have to regard the half-yearly dividends as part of their livelihood. Any interference with the amount which may be paid away by the Company in this way is therefore a very serious matter. To impress this fact upon the notice of the members of the Legislative Assembly, a return was presented to the House, giving the number of shareholders in the Company and their holding of shares. It was found that there were 744 female shareholders, 658 male shareholders, 130 shareholders in deceased estates, 136 for shares held in trust, and 23 for shares held by trustee companies. Nearly 60 per cent. of the shareholders were holding parcels of from 1 to 50 shares, and 79 per cent. were holding from 1 to 100 shares. This is a factor of the situation which should receive the serious consideration of those upon whom rests the responsibility of dealing with this important matter.

Mr. G. A. FIELDING seconded the motion, which was carried unanimously; and the dividend recommended, of 6s. 6d. per share, was thereafter agreed to.

The proceedings closed with a vote of thanks to the Chairman and Directors.

YORKTOWN AND BLACKWATER GAS COMPANY.

The Annual Meeting of this Company was held on the 18th inst.—Mr. D. SPARVELL (the Chairman) presiding.

The Directors reported that, after meeting all charges, interest on debentures, and the dividend on preference shares, and allowing for depreciation, there remained a balance of £9897, out of which they recommended the payment of dividends, with the interim dividend already paid, of 12½ per cent. per annum on the original shares, and of 8 37-40ths per cent. uyon the old and the additional shares, all less income-tax.

The CHAIRMAN, in moving the adoption of the report, said that, as the shareholders knew, they had had during the past year a very anxious time on account of the war; but he was glad to say that they were quite as well off as a great many other gas companies, but not so well off as they would wish to be. He proceeded to deal in detail with the items in the accounts, and stated that the make of gas for the year was 96¾ million cubic feet, being an increase of 8 per cent.; and they had an equal increase in the quantity sold. The weak part of their statement was the residuals. At the beginning of the year coke was almost unsaleable. Though they had sold more, this item was down by £1004; sulphate, owing to freights being so high, was down 25 per cent.; and the same remark applied to tar. For the present year everything pointed to dearer coal, though they would not feel the effects of it, as their contracts would cover the first six months. In order to meet the increased cost, the Directors regretted that they would have to raise the price of gas 2d. per 1000 cubic feet, which would bring it up to 3s. 4d., the same as their neighbours charged.

The VICE-CHAIRMAN (Mr. A. Hitchcock) seconded the motion.

Mr. R. W. EDWARDS offered a few remarks in friendly criticism. He said the shareholders were obviously not getting their full statutory dividends—rather 10s. per cent. short on the "original" shares, and 7s. per cent. short on the "additional" shares, which was lower than they should get, as based on the price of gas. He was going to suggest that if they had made up their minds to increase the charge 2d. per 1000 cubic feet, at any rate the dividends they now paid should, notwithstanding, remain unaltered—provided, of course, there were sufficient funds. The higher cost of coal and the depressed market for residuals represented conjointly a net increase of 81 per cent. on the cost of coal. With reference to the reduced revenue from sulphate of ammonia, the yield per ton of coal carbonized had dropped 50 per cent., representing a loss of £264, which would go considerably towards making up the deficit of £374 in the dividends they were declaring. As to the income-tax, to which the Auditors called attention, he was interested in a company from which he got his interest free of tax. He wished for some information on this subject. Having referred to some few other details, Mr. Edwards said there was one matter for congratulation which the Chairman did not mention; and he (the speaker) was going to congratulate them on the substantial increase of 14½ per cent. in the gas supplied to private consumers by meter. In these days, this was an item for much congratulation.

The CHAIRMAN, in reply, said the Directors saw their way clear to paying the full dividend. The reason they did not do so before was that it was doubtful whether they would not, in the present state of the market, have to put up the price. As to sulphate of ammonia, the reason they had not made so much was labour troubles. They had had 25 per cent. of their men go to the war, and the coal they used did not give such a good yield of ammoniacal liquor. As to the income-tax not being deducted on the loan and preference shares, this was due to an agreement that they should pay the interest free of income-tax, because at that time they were glad to get money where they could. It was the same with the debentures. But whether it was according to law he did not know.

Mr. ROWE having replied to other points raised by Mr. Edwards,

The motion was carried unanimously.

The retiring Directors and Auditor were then re-elected; and votes of thanks accorded to the officials and staff, and to the Chairman and Directors, brought the proceedings to a close.

UNITED GAS-WORKS DEVELOPMENT COMPANY.

The Treasury and a Capital Issue.

From time to time, there has been in our columns criticism of this Company's promoting operations. The Directors, or those who officially work for the Company, know that some value attaches in the eyes of investors to the words at the top of an invitation for capital: "This issue has been sanctioned by the Treasury." Such an announcement appears to set the seal of the Treasury upon the eligibility of the capital as an investment. We admire the acumen of those responsible for the operations of this promoting concern in securing the sanction of the Treasury to an attempt to obtain more money. But it would be interesting indeed to see what evidence was placed before the Treasury to convince that body that the issue was needful at the present time. The Treasury have drawn a sharp line between what they consider needful and otherwise. Is this promoting venture engaged in any way on Government work, or is it not, or is the money required for promoting fresh concerns, with huge capitals in relation to the amount of business? However, under the auspices of the Treasury, the Company are trying to sell a number of £10 debentures to bearer, as well as some ordinary shares. It is stated that there has been "issued" 2000 ordinary shares of £1 each, and 500 debentures of £10 each. But the balance-sheet at Oct. 31 last only shows 607 £1 shares issued and fully paid, and 190 £10 debenture bonds—together £2507. In view of this, the remarkable balance-sheet is perhaps worth placing on record, without much comment, as every gas man will be able to appraise it for himself. On both sides—liabilities and assets—it has its humorous points.

BALANCE-SHEET, OCT. 31, 1914.

LIABILITIES.

	£ s. d.	£ s. d.
Nominal capital	2000 0 0	
Shares issued and fully paid		607 0 0
Authorized debenture issue	5000 0 0	
Debentures issued and fully paid		1900 0 0
Sundry creditors—		
On open accounts	29 2 1	
Balance of Narberth contract	632 19 3	
Income-tax (estimated)	476 0 0	
Guaranteed interest on shares of East Pembroke and Wilts County Gas Companies	1616 10 0	
		2754 11 4
Debenture interest (proportion of net profits)		285 0 0
Debenture premium reserve fund account		57 0 0
Profit and loss account—balance being undivided profit		3341 6 3
		£8944 17 7

ASSETS.

	£ s. d.	£ s. d.
Various options purchased in accordance with agreement dated Nov. 3, 1913	1800 0 0	
Less amount written off	1200 0 0	
		600 0 0
Preliminary expenses	159 18 6	
Less amount written off	59 18 6	
		100 0 0
Cinema theatre, goodwill, &c., of the business	643 8 11	
Less amount written off	200 0 0	
		443 8 11
Investments at par value		5285 0 0
Cash at bankers—		
Deposit account	2000 0 0	
Current account	510 19 8	
		2510 19 8
Petty cash in hand		5 9 0
		£8944 17 7

The items require individual study to obtain their full flavour. The chartered accountants (Messrs. Chadwick and Co.) report that, in their

opinion, the balance-sheet is properly drawn up so as to exhibit a true and correct view of the state of the Company's affairs, "according to the best of our information, and the explanations given us, and as shown by the books of the Company."

Since the date of this balance-sheet, it is said that the share capital—that is, the nominal not the issued—has been increased from £2000 to £20,000; but the Directors remark that they do not contemplate issuing the remaining 18,000 shares at present. From the foregoing balance-sheet it looks as though there are a good many of the previous 2000 shares still requiring holders before the "remaining" 18,000 are issued. However, the Directors are anxious to get rid of some more £10 debentures and ordinary shares. The bait held out to investors in debentures takes the following form in the prospectus:

> The debentures are to bearer, and carry interest at the rate of 10 per cent. per annum, payable quarterly by coupons attached to the bonds. These bonds are redeemable at a premium of 10 per cent., or £11 10s. per £10 debenture, at any time upon the holder giving six months' notice to the Company. In addition to the 10 per cent. interest, the debenture holders are entitled to participate in half the profits of the Company up to a further 15 per cent. per annum, making a total of 25 per cent. per annum on each £10 debenture.

The Directors appear to be endeavouring to get rid of the debentures in parcels of fifty. A circular letter signed by "Wm. Judd," Secretary, has been sent out offering the debentures and some ordinary shares. The opening words of the circular-letter are worth dwelling upon; but our readers may have the benefit of the whole lot:

> Under exceptional circumstances, I have been authorized to sell 50 £10 debentures and 300 fully-paid ordinary shares of £1 each in the above Company. I am instructed to accept par value for the debentures—namely, £10 each, and 25s. per £1 share, For your information, I beg to enclose the audited balance-sheet. As you will see from the balance-sheet, the result of the Company's operations during the year ended October, 1914, has been exceedingly satisfactory, resulting in a net profit of £3341 6s. 3d., after deducting debenture interest to the full amount of 25 per cent., writing-down options account £1200, cinema account £200, preliminary expenses account one-third, and creating a reserve fund for payment of the debenture premium. It is seldom that an interest in a promoting Company which commands large profits can be obtained; and it will therefore be seen that this is an exceptional opportunity of securing a most profitable investment at a low figure. Awaiting the favour of your reply, stating the number of debentures and shares you would like me to secure for you,

The word "secure" interests us—in fact, we have been guilty of smiling over it. But fancy a Company with debentures offering 25 per cent. interest having to canvass for buyers at par in this way. It ought to pay the Directors to borrow the money from their bankers, and take up the lot themselves. Why do they not do it? This advertisement that we have given the Company's requirement of more money has not been paid for, and we have no intention of rendering any account for the service.

ADDITIONAL POWERS FOR THE GUILDFORD GAS COMPANY.

Board of Trade Inquiry.

The application of the Guildford Gas Company to the Board of Trade for a Provisional Order to enable them to extend their limits of supply, raise additional capital, and for other purposes, was the subject of an inquiry at the offices of the Board, Whitehall, on the 19th inst., by Mr. Garnham Roper, one of the Assistant-Secretaries. The application was opposed by the Guildford Corporation, the Surrey County Council, the Guildford Rural District Council, and the three Railway Companies in the district.

The promoters were represented by Mr. Seager Berry, a member of the firm of Messrs. Sherwood and Co., their Parliamentary Agents, who stated that the objections of the Corporation had been compromised by the Company agreeing to reduce their additional capital by £91,000, to make the standard price 3s. 6d. per 1000 cubic feet within the original limits and two miles from the works, and not to increase the price from 3s. 6d. to 4s. 6d. in Merrow and Shalford should these parishes come into an enlarged borough. The Surrey County Council had endeavoured to get clauses inserted empowering them to fill-in and make good the surface of any trenches opened by the Company in the highways; but they had been unable to agree to terms, and were going to take the matter to the House of Commons. The Company wished to raise the present standard price of 4s. beyond two miles from the works to 4s. 6d. beyond four miles; and to reduce the illuminating power of their gas from 15 to 14 candles, the quality that was now usually adopted.

Evidence in regard to the Company's capital was given by Mr. A. F. Phillips; and Mr. Walter Clode and Mr. C. L. Morgan addressed the Assistant-Secretary on behalf of the Railway Companies. The Shere Parish Council and the Guildford Rural District Council considered the standard price should be 4s.; and Mr. Berry explained that the Company were now charging 9d. less than the standard. The Rural District Council also wished to have a clause inserted giving them power to reinstate the roads, and charge the Company with the cost; but the Company would not agree to this. Mr. Berry, however, agreed to accept a clause to the effect that not more than 6d. per 1000 cubic feet extra should be charged in the outer area. The provisions proposed by the Railway Companies could not be accepted.

The Bangor Urban Council have agreed to contribute £685 out of the profits of the gas-works for the present year towards the expenses of the Sanitary Authority.

MANCHESTER AND A WAR BONUS.

Keen opposition is being waged in Manchester to the proposed payment of war bonuses to certain employees of the Corporation. At a meeting of the Executive Committee of the Ratepayers' Association, it was decided to "organize a strong protest against any proposals to incur extra or unnecessary expenditure, and in particular against the proposal to grant to municipal employees a war bonus." In the last number of the "JOURNAL" [p. 759] it was pointed out that to give a war bonus of 2s. per week to every adult employee in the Gas Department receiving less than 40s. per week, would mean an outlay of £7800 net per annum; the number of men affected being 1560.

Mr. Hislop, who at the meeting of the Council opposed the proposal, returned to the attack early last week, and declared that "the payment of a war bonus to workmen was an inducement or premium to stay at home and leave their mates at the front to fight." With regard to the statement of the Gas Department that they were short of men at the present time, and that they must pay a war bonus to keep what men they had, his suggestion was that the department should give up for the present all works of extension and renewals, except where necessary. He thought this would solve the difficulty to a great extent.

At a well-attended meeting of the Gas Committee—whose income, by the way, promises to be seriously diminished this year unless prices are raised—it was decided to recommend that a bonus of 2s. be given to all employees earning less than 40s. per week. The Water-Works Committee also met and decided to grant a war bonus of 2s. per week to all employees receiving up to 30s. weekly. The Finance Committee, however, gave a strong lead on the question to departments, the Committee themselves deciding that no bonus should be granted to employees in the Finance Department. This is bound to have a far-reaching effect upon the policy of the City Council at its meeting this week, when the whole question of war bonuses is to be reconsidered.

BIRKENHEAD GAS STRIKE.

At the beginning of last week, there were still no signs of a settlement of the gas-workers' strike at Birkenhead. It was, however, stated on the Monday that "the band of workers were steadily getting the upper hand, and in the course of a day or so the officials hoped to give an improved supply." The men had already been granted a war bonus; but they demanded a permanent increase of wages.

On the same day, there appeared in the local Press a letter from Alderman J. H. M'Gaul (Chairman of the Gas Committee), stating that if the Engineers and office staff, with the help there was at hand, had been given fair-play at the start, little or no inconvenience would have occurred to the public; but fair-play was not given, as "they had to battle with numerous wicked and wilful interferences with their machinery for carrying on the manufacture of gas." As to the future, he said he would make no rash promises; but the gas consumers could depend upon the Engineers and the Committee putting forth every effort to give them a full and adequate supply of gas for all purposes at the earliest possible moment. The task of the Committee was not at all an agreeable one; but there was no alternative in the circumstances in which they were placed by the men leaving the works and compelling quite another fifty men to come out the following day.

Under this letter appeared the following statement by Mr. T. O. Paterson (Engineer) and Mr. R. H. Brown (Deputy-Engineer).

> Coalers left work 1.27 p.m., March 10. Last shift men left work 6 a.m., March 11. Date and hour when coal-breaker was found unusable, 9.30 a.m., March 11. Time spent in removing obstruction, 16 hours. Retorts thrown out of action from March 11. A considerab'e percentage are still out of work.
>
> A 24-inch valve used in connection with pumping gas to Laird Street gasholder found jammed when wanted, and must remain out of use indefinitely. Fortunately other means are available, which temporarily keep the works and Laird Street in touch.
>
> The clerical staff are breaking about 130 tons of coal required per day, and conveying it up to the hoppers in less time than the men now out on strike did.
>
> Men working on boilers and on vertical retorts are all very keen to have the job at present wages.

Then there was correspondence between Mr. J. R. Clynes, M P., of the National Union of Gas Workers and General Labourers, and Lieutenant-Colonel C. E. Earle, Commanding the 16th (Service) Battalion ("Bantams") Cheshire Regiment, as the result of a letter addressed by the former to the Town Clerk of Birkenhead. The subject, of course, was the employment of soldiers to take the place of strikers at the gas-works In this letter, Mr. Clynes protested against the action taken to compel soldiers to take the places of Birkenhead gas-workers, which step, he said, "inflicts a serious wrong upon men who enlisted for totally different purposes." The men's leaders, he added, desired to avoid a stoppage; but the proposal submitted to them to postpone for a long time the decision on the men's claims produced the stoppage that they could no longer prevent.

On a copy of this letter being sent to Lieutenant-Colonel Earle, he wrote, in answer, that "no soldiers have been compelled to do any work at the gas-works, as all who have worked have done so entirely of their own free will. . . . Had my men not worked at the gas-works, the whole of the battalion would have been without any hot food. I later heard that important Admiralty work at Cammell-Laird's was being delayed owing to shortage of gas; and on this ground again I felt justified in taking the action I did."

In his reply, Mr. Clynes said: "It may be that no soldiers have been compelled to work; but when, as your letter says, you 'asked men to volunteer to make gas,' there could obviously be but one result from such a request. I was assured that no work at Cammell-Laird's could be affected by any shortage of Corporation gas, as the firm made their own gas; and we would certainly not desire that the food of your

men should be interfered with through gas shortage. If the action of your men could be limited to producing 'sufficient gas to cook the food for the men' we might have little to say. We see no reason for the Military authorities taking a course which at best is a serious blemish on the service of men who enlisted for worthier duties in their country's cause."

On Thursday, the third week of the strike began; and the officials and "Bantams" were steadily increasing the quantity and improving the quality of the gas supplied to the town and the surrounding districts. In the course of an interview, Mr. Paterson expressed the opinion that, provided no untoward incident occurred, it would be possible to give the town a normal supply of gas by the beginning of this week.

In the course of an interview last Friday with a representative of the "Liverpool Post," Alderman M'Gaul recounted the events which led up to the strike, and what had since happened. He said that, in addition to demanding more wages, the men asked that those engaged on the vertical retorts should have their working shift reduced from eight to six hours, making four shifts per 24 hours instead of three. The few men who remained at their work and their wives had been seriously threatened; and some of them were forced to leave owing to the action of the strikers. The situation was, however, now well in hand.

A special meeting of the Town Council is to be held to-day to consider the position.

HUDDERSFIELD GAS-WORKS MANAGEMENT.

Three Months' Minutes of the Gas Committee on the Subject.

The "Huddersfield Daily Chronicle" for the 18th inst. contained the minutes of the Gas Committee of the Corporation relating to the case of the Gas Engineer and Manager, Mr. E. A. Harman, which was dealt with in the "JOURNAL" for the 23rd ult. (p. 460). They date back to the 14th of December, and were confirmed at the meeting of the Council on the 17th ult. They are preceded by an explanatory statement by the "Chronicle" to the effect that they were not handed to the representatives of the Press at the February meeting, that no intimation whatever was given that the minutes were being submitted for confirmation, and that an application by their representative elicited the reply that there were no supplementary minutes for the Press. It will be seen that the minutes (given below) are bare in the extreme, and those who wish to understand the position fully are referred to what has already appeared in the "JOURNAL."

On Monday, Dec. 14, 1914, at a meeting of the Committee, there were present Councillor Mitchell, in the chair, Aldermen Jessop, Taylor, and Wheatley, Councillors Barnes, Boothroyd, Calverley, Gibson, Halstead, Kilburn, Platts, Schofield, Shaw, Sheard, Singleton, J. Sykes, Woffenden, and J. B. Wood. The conditions prevailing at the gas-works were further considered, and it was resolved: "(1) That the Manager be asked to forward to the Town Clerk in writing by Thursday next, the 17th inst., replies to the questions now put to him. (2) That the Town Clerk lay a copy before each member of the Committee at their adjourned meeting to consider this matter further on Friday next."

On Friday, Dec. 18, 1914, at a meeting of the Committee, there were present Councillor Mitchell, in the chair, Aldermen Aston, Jessop, Taylor, and Wheatley, Councillors Barlow, Barnes, Boothroyd, Brown, Calverley, Halstead, Kilburn, Platts, Schofield, Shaw, Sheard, Singleton, J. Sykes, Woffenden, and J. B. Wood. The Committee considered the replies in writing of the Engineer (of which a copy had been supplied to each member) to the questions put to him at the last meeting, and the consideration of the matter was adjourned.

On Monday, Jan. 4, 1915, at a meeting of the Committee, there were present the Mayor (Alderman Blamires), in the chair. Aldermen Aston, Taylor, and Wheatley, Councillors Barlow, Barnes, Boothroyd, Brown, Calverley, Gibson, Halstead, Kilburn, Mitchell, Platts, Schofield, Shaw, Sheard, Singleton, J. Sykes, Woffenden, and J. B. Wood. Copies of the answers of the Chairman and Vice-Chairman to the report of the Engineer had been previously supplied to each member of the Committee and the Engineer; and the whole matter having been carefully and fully considered by the Committee, it was resolved:

"(1) That the Committee, having carefully and fully considered the report of the Engineer and the answers thereto of the Chairman and Vice-Chairman, are of opinion that the results of the carbonizing of coal are not due to inferior coal. Further, that the Engineer has been consulted on, and agreed to, every purchase of coal made. The Committee are also satisfied that the Town Clerk was instructed by the Engineer to prepare a contract with Mr. Wood before the six waggons of coal (sent specially for testing purposes) had arrived, and that no test had been made of the six waggons on which the Engineer reported to the Chairman and Vice-Chairman that the test was satisfactory, and that the coal was similar to Whitwood. On the other points raised, the Committee unhesitatingly accept the report of the Chairman and Deputy-Chairman. (2) That the Town Clerk send a copy of this resolution to the Engineer."

On Tuesday, Jan. 19, 1915, at a meeting of the Committee, there were present the Mayor (Alderman Blamires), in the chair, Aldermen Taylor and Wheatley, Councillors Barnes, Boothroyd, Brown, Calverley, Gibson, Halstead, Kilburn, Mitchell, Platts, Schofield, Shaw, Sheard, Singleton, J. Sykes, Woffenden, and J. B. Wood. After carefully considering the Engineer's latest reply (a copy of which has been supplied to each member of the Committee), and submitting him to a lengthy examination, the Committee reaffirm their former resolutions, and unanimously support the Chairman and Vice-Chairman in their action.

On Friday, Feb. 5, 1915, at a meeting of the Committee, there were present Councillor Halstead, in the chair, the Mayor, Aldermen Aston, Jessop, Taylor, and Wheatley, Councillors Barnes, Boothroyd, Brown, Calverley, Gibson, Kilburn, Platts, Schofield, Shaw, Singleton, J. Sykes, Woffenden, and J. B. Wood. The question of the administration at the gas-works was considered, and it was resolved that Mr. E. A. Harman's appointment as Gas Engineer and Manager to the Huddersfield Corporation be terminated, and that he be paid three months' salary in lieu of notice.

The Chronicle adds that, under the head of the "General Purposes Committee," it is stated that at a meeting held on the 15th of February they further considered the minutes of the Gas Committee of Dec. 14 and 18, Jan. 4 and 19, and Feb. 5, and that they were adopted and confirmed. It is stated that these minutes also were confirmed by the Council on Feb. 17. In this case also the minutes were not handed to the representatives of the Press at the February Council meeting, and no intimation was conveyed to the reporters present that they were being submitted to the Council for confirmation.

THE EXAMINATIONS IN GAS-FITTING.

Practical Tests of Workmanship.

In the notice of the programme of the City and Guilds of London Institute for the session 1914-15 which appeared in the "JOURNAL" for the 4th of August last, it was mentioned that an examination would be held in "Gas-Fitting;" and in the succeeding issue an indication was given of the subjects on which questions would be put. It was also stated that local practical examinations would be held prior to the written examinations in Grade II. and the Final. Their object was to test the candidate's ability in the making of blown, screwed, and flanged joints, adjustment of burners, fixing of appliances, and the running of pipes for internal gas-fittings. They have now been held, and the following was the work the candidates had to do; the time allowed being given in brackets.

GRADE II.

1. Prepare and solder together two lengths of ½-inch lead or compo. gas-pipe. [Half hour.]
2. Screw two lengths of ¾-inch iron barrel (pipe) together, attach ¾-inch equal tee, and leave all sound for testing. [One hour.]
3. Examine the following, and state the faults (if any) in each: (1) Gas-bracket, (2) "C" burner, (3) inverted burner. [Half hour.]
4. Examine gas-cooker, and indicate the faulty part and what is wrong with same. [Half hour.]
5. Explain fully the working of a dry gas-meter. [Quarter hour.]
6. Explain how you would connect the outlet pipe to a dry gas-meter, and show how you would deal with condensation. [Quarter hour.]

Note.—The candidate must not ask the Examiner whether the result of his examination of the tests Nos. 3 and 4 are correct or not.

FINAL.

1. Prepare and make a right-angled branch connection on ¾-inch lead or compo. gas-pipe. [One hour.]
2. Cut and screw a length of ¾-inch iron barrel (pipe) for running joint, connect same to ¾-inch equal tee and short length of straight pipe, and test same for soundness. [One hour.]
3. Fix temporary gas supply to gas-fire, including control cock and brass tube. [One hour.]
4. Adjust gas-fire to give best results in heating effect and prevention of escape into the room of products of combustion. [Quarter hour.]
5. Examine sketch of gas-heated circulator, and state if it is shown in proper working order; if not, what alterations are necessary? [Quarter hour.]
6. Examine low-pressure outside lamp, and explain to the Examiner the utility of each part. [Half hour.]

Note.—The candidate must not ask the Examiner whether the result of his examination of the tests Nos. 5 and 6 are correct or not.

Accident at an Electric Power Station.—Damage estimated at about £20,000 was caused at the Cardiff Corporation electric power station, by the bursting of a fly-wheel, weighing about 7 tons, last Sunday week. Fortunately, no one was hurt; but the tram-car service was brought entirely to a standstill, and many streets dependant upon electricity were left in darkness. A piece of the fly-wheel, weighing about half-a-ton, was found buried in a garden 100 yards from the power station, through the wall of which it must have been driven. The engine had been running only five or ten minutes, when the driver (who had gone to attend to another engine) saw that it was racing. On hastening to it, he found that the engine was accelerating at such a rate, that he thought the best thing to do was to give warning to all to get clear.

Storage and Filtration of Water.—During an inquiry at Worcester into an application to the Local Government Board by the Worcester City Council for sanction to borrow a sum of about £10,000 for water supply purposes, it was stated that the proposal was to provide two new filters. The Medical Officer of Health (Dr. M. Read) said, while he agreed that additional filtration would be an advantage, he would advocate storage before filtration as the better course. Councillor Moore remarked that the Water Committee had thrashed out the question of "Storage *v.* Filtration;" and it was decided that to provide extra filtration would be by far the better plan. Worcester had excellent water. The Engineer (Mr. T. Caink) pointed out that the cost of putting down ten days' storage capacity would be about £20,000. The Town Clerk (Mr. S. Southall) called attention to the attitude of the Board with regard to sanctioning new loans in present circumstances; and the Inspector (Mr. A. W. Brightmore) replied that he thought the Board would probably consider this question a more important matter than (say) a scheme for street widening.

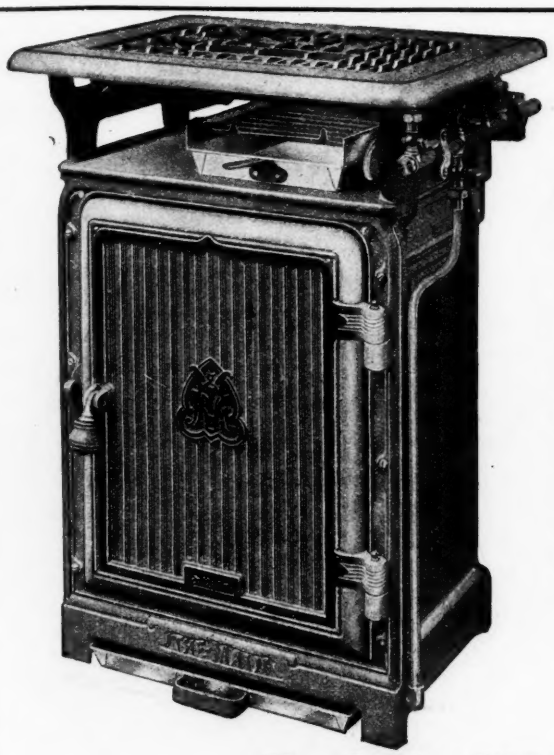
JOHN WRIGHT AND EAGLE RANGE, LIMITED.

The Twenty-Fifth Ordinary General Meeting of this Company, which was held at the Grand Hotel, Birmingham, was presided over by Mr. H. JAMES YATES (Chairman and Managing-Director). The report which was presented, and adopted, was briefly noticed in the "JOURNAL" for the 9th inst. [p. 615].

The CHAIRMAN, in the course of his address to the shareholders, said that, large as was the business done last year, it would have been far greater had their output capacity been able to cope with the orders placed with them. Arrangements had now been made by which it was hoped that any shortcomings in this direction would be put right in the coming year; but, of course, like many others, the Company would be seriously handicapped by shortage of labour on account of the war. For some years past, they had gradually been developing the section of their business which was concerned with the manufacture of all types of gas-furnace apparatus for use in factories. The potentialities of this business to-day were enormous. As yet comparatively few manufacturers realized how much they had to gain by installing this class of apparatus in their works, and abandoning old rule-of-thumb methods of annealing, hardening, and quenching of steel, &c. It had always been the practice of the Company to maintain their premier position by securing the benefit of the best skill available; and the Directors had acquired a controlling interest in the business of Messrs. Brayshaw, of Manchester, who had had greater experience in the class of work that he had referred to than anyone else in this country. A new Company was recently registered under the title of Brayshaw Furnaces and Tools, Limited. A very interesting exhibition had been taking place at Sheffield, where Messrs. Brayshaw had been demonstrating to the local manufacturers the working of their various types of furnaces, &c. The result of these demonstrations, great as they had been expected to be, had far exceeded the anticipations of the Directors. At their Essex Works, in the section devoted to the manufacture of furnaces, there had been great and continuous progress; and they never were so full of business of this class. For months past they had been manufacturing a large number of special gas-furnaces for the annealing of shells and shell-cases. They were particularly proud of the fact that the furnace was of their own design, and that they had thus been the means of helping to increase considerably the output of shells and cases, and to give them that uniformity which was so essential in the avoiding of waste. He had mentioned on more than one occasion how the Company had created the modern gas-fire, and how all the other makes of gas-fires were now made on lines very similar to their own. In fact, their "Thermo X" fire-clay radiants had long formed a standard throughout the industry, and other manufacturers had had to construct their fires so as to take the "Thermo X" radiant. But, much as they had already accomplished in so improving the gas-fire that one could really use it as an effective means of replacing the coal-fire, there was still a very important factor that had not been exhaustively dealt with, and that was the question of ventilation. Most rooms depended largely for their ventilation on the coal-fire places. Now, a gas-fire had for a long time only a small flue-outlet intended to remove the products of combustion, and by no means always succeeding in that. A number of years ago, by introducing their device of wide oval flues, the Company had caused their fires not only to remove all combustion products, but also to aid the general ventilation by removing a large quantity of air as well. Apart from this, there still remained the drawback that a gas-fire, when placed in front of a coal-grate, greatly reduced its chimney-outlet space, and so restricted the ventilation hitherto effected by the coal-grate to little or nothing beyond that due to the flue outlet of the gas-fire. Though in their own case the degree of ventilation with their gas-fires was exceptionally large, they were determined not to rest content with anything short of that of the coal-grate. They had been experimenting for a long time past in this connection, and last winter introduced their new injector-ventilating gas-fires, by means of which they ventilated a room with the gas-fire equally well as with a coal-fire, and so had removed the one remaining point in which the gas-fire had hitherto fallen short of the coal-fire. It was quickly realized in the industry that this invention was going to place their gas-fire far in advance of all others; and, in consequence, a strenuous effort was made from competitive quarters to prevent the sealing of the patent. The case, however, when heard in London, was quickly decided in the Company's favour, as it was clear that they had applied a principle to gas-fires that had never been so employed before. Like most other manufacturing concerns, they had had considerable disorganization owing to the gradual departure of numbers of men to join the forces. Altogether since the war began they had lost between 600 and 700 workmen. In addition to a subscription of £500 which the Board made on behalf of the Company to the Prince of Wales's Fund, suitable arrangements were in operation for supplementing week by week the army provision for the dependants of men who were with the Colours.

After the report had been adopted, a dividend was declared at the rate of 2s. 6d. per share (free of income-tax) on the ordinary shares for the half year ended Dec. 31.

Corporation Wages at Leeds.—A special meeting of the General Purposes Committee of the Leeds Corporation was held last Thursday, to consider the claims of several unions representing the Corporation employees, who were asking for increased wages. Among other requests received, the Leeds Branch of the National Union of Gas-Workers and General Labourers applied for an advance of 1d. per hour for all workers in the Gas Department, numbering about 1000 men. The consideration of all the applications was deferred until April 14, in order that inquiries might be made as to what is being done by other employers, and so that the financial cost of the advances might be estimated.



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GLOVER AND MAIN, LIMITED.

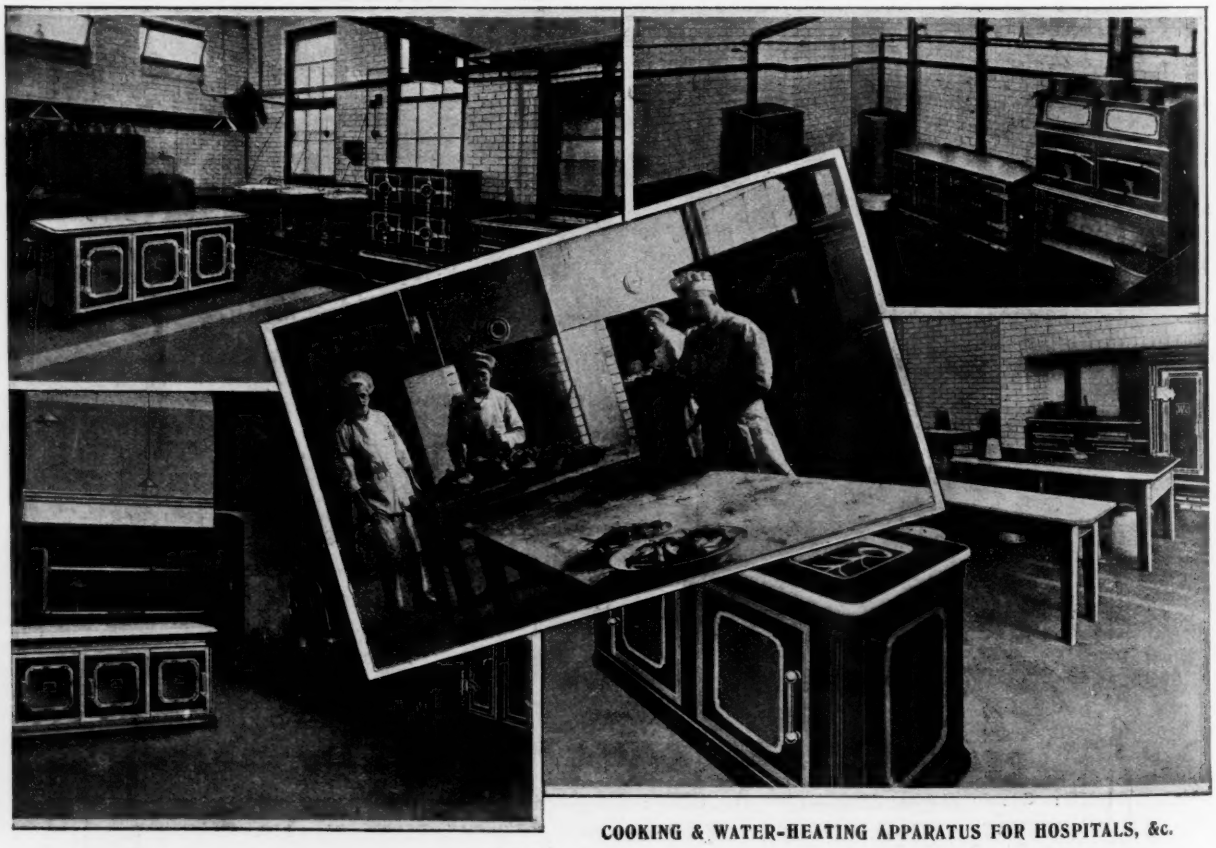
In the absence of the Chairman (Mr. R. B. Main), through illness, Mr. A. P. MAIN (the Vice-Chairman) presided at the annual general meeting of the Company, which took place last Thursday.

The CHAIRMAN, in moving the adoption of the report and accounts for the year ended Dec. 31 last, said that, notwithstanding certain difficulties which had had to be faced, the working had, on the whole, been satisfactory. The cost of raw materials had increased, and the labour charges showed an upward tendency; but, wherever possible, economies had been effected and expenses reduced to a minimum. The sales had been well maintained, and showed a satisfactory increase over the previous year. Up to the end of the present month, too, the sales continued satisfactory, as compared with the same three months of last year. Referring to the accounts, they would notice under the profit and loss account that the total revenue received amounted to £19,623—an increase of £861. After charging the whole of the expenses for the year, there was a net profit of £16,399 carried to the balance-sheet, which, with the sum brought forward from last year, amounted to £17,943. In consequence of the expansion of the business of the Trading Companies, additional accommodation had had to be made at the Edmonton and Falkirk factories. At Edmonton, a new warehouse, packing-shop, and Berlin blacking shop were added last year. Two of the Directors, Sir Paul A. Makins and Mr. W. R. Glover, as well as the Sales Superintendent, Mr. R. B. G. Glover, were now on active service. Major W. R. Glover and Captain R. B. G. Glover were in France, and Captain Sir Paul Makins was abroad "somewhere." Thirteen members of the staff and 160 employees at Edmonton, Birmingham, and Falkirk had answered the country's call, and were now serving with the forces. As far as was known, three employees had laid down their lives for their King and country; and he felt sure they all extended to the relatives their deepest sympathy in their bereavement. Where necessary, the Trading Companies were paying to the relatives and dependants of those who had enlisted an allowance not exceeding 10s. per week, and 1s. per week for each child. These allowances were highly appreciated, not only by the recipients, but by the men themselves, all of whom had expressed their warmest thanks to the Directors and other officials. Shortly after the outbreak of the war, a special constabulary force was formed from among the older members of the staff and employees at Edmonton. For six months there were 220, and at present the number stood at 150. Since August, the local bridges, pumping-stations, and water-works had been guarded night and day by these men, who deserved all praise for their self-sacrificing efforts. The Directors recommended a final dividend at the rate of 5 per cent. per annum on the preference capital (less income-tax), which would absorb £1250, and a final dividend at the rate of 11 per cent. per annum on the ordinary share capital (less income-tax), which would absorb £11,000, leaving £443 to be carried forward.

Mr. THOMAS GLOVER seconded the motion, and remarked that, with their large resources, the Trading Companies were able to compete for the very many Government tenders which were being offered, and were successful in obtaining a substantial share of the business. The result of this was that all the works had been kept employed to their full capacity. The dislocation of the organization by the absence of nearly 20 per cent. of the staff and employees now serving with the Colours, was considerable; and the resulting strain on those forced to remain was very heavy. The shareholders would appreciate the spirit shown by the remaining members of the staff when he informed them that, with the exception of one Belgian refugee who had been given temporary employment in the offices, and two or three boys, the whole of the work had been carried on by the remaining members, at very great personal sacrifice of their leisure, and without extra remuneration. Whether at the end of the war this loyal service on the part of the staff was to be recognized was a matter on which the Board would be very much guided by the shareholders' wishes. In reference to the prospects of the current year, they were faced by very heavy increases in the prices of material, and by what they regarded as reasonable increases in wages to the men; and other expenses of every sort would tend to go up. Every effort had been made, and made successfully, to reduce the proportion which expenses bore to the turnover; and as the turnover up to the present this year had been maintained as compared with last year, the Board were very hopeful that they would be able to produce a favourable balance-sheet and profit and loss account next year. The final results would largely depend upon whether they could obtain a sufficient share of Government contracts to keep the works fully employed. There appeared for the first time an item "Freehold premises in Birmingham." They had been established in Birmingham as stampers and piercers for many years; and recently they had the opportunity of developing business, both in meters and stoves, on the Midland ground. The present premises, in view of this growing business, had been exceedingly inconvenient and cramped for some time past; and the Directors had acquired on very good terms before the war a much larger factory.

After some remarks by Mr. KENNETH AIRD with reference to the Falkirk works, the report was adopted, the dividends recommended were declared, and the Directors and staff were thanked for their services.

Brighton (Victoria) Gas Company.—The accounts of the Brighton (Victoria) Gas Company for the six months to Dec. 31 showed a net profit of £4147, against £3762 for the corresponding half of 1913. The dividend is at the usual rate of 6 per cent. per annum. The capital is £60,000 in shares of £1 each; but in order to provide funds for extensions to plant necessitated by the expansion of the business, and to place the temporary loan on a satisfactory footing, the Directors have decided to issue debentures for £25,000. Sales of gas for the half year showed a gain of 10·7 per cent. over those of the corresponding period in 1913.



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WRITE FOR ILLUSTRATED LISTS **JOHN WRIGHT & CO., ESSEX WORKS, BIRMINGHAM.**

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

At a recent special meeting of the Kinross Town Council, a claim was submitted from the Kinross and Milnathort Gaslight Company, Limited, for the purchase of their works by the Town Council, who adopted the Burghs Gas Supply (Scotland) Act, 1876. The capital of the Company is £3004, and the profits at the end of the last financial year were £598. The Company estimate their undertaking to be worth £25,000, which is considerably in excess of what the Council believed to be the value of the works when they entered upon the proposal. The matter will be the subject of an arbitration to be held in the course of a few weeks. Mr. W. R. Herring is the Arbitrator for the Council, and Mr. Adam Macpherson will act in a similar capacity for the Company; the Right Hon. Charles Scott Dickson, K.C., M.P., being the Umpire. The Council's answers to the Company's claim will shortly be lodged.

Under the joint action of the Gas and Electricity Committee of the Glasgow Corporation, plant for the extraction of oil by the Maclaurin process is being installed at Govan. At a colliery in Ayrshire, a full-sized oil-distilling plant is now at work, capable of dealing with 24 tons of coal in 24 hours. It is stated that the results have been thoroughly satisfactory. Oil is obtained, as well as other bye-products of coal, and smokeless fuel. The patentee is supervising the erection of the new plant at Govan, with the assistance of Mr. Alexander Wilson, the Glasgow Corporation Gas Engineer. [Reference was made to this matter in "Electricity Supply Memoranda" last week.]

Mr. A. Horsburgh Campbell, the Burgh Engineer of Edinburgh, in his annual report to the Public Health Committee of the Town Council on the observation and abatement of smoke nuisances during the past year, says that the need for regular observation continues unabated, notwithstanding the fact that during the year there were introduced into several of the large works smoke-consuming appliances with markedly beneficial results. On a smaller scale, though with a like result, the introduction to other works of efficient smoke-preventers has been done at a very low—indeed, compared with the resulting benefits, almost nominal—cost. In this work of sanitary reform the Corporation had its share, on at least one public institution, at a very modest outlay. Mr. Campbell says recent experience proves that the effectual consumption of smoke is quite compatible with the efficient and economic working of steam-boilers; and he adds that the increased use of gas for heating and cooking and the adoption of electric current for power in many of the city works and factories, are factors of much account in this crusade against "the needless and wasteful discharge of smoke."

At the Forfar Gas-Works new carbonizing plant has been installed, and other improvements have been effected. To meet the outlay, a loan of £10,000 is being negotiated by the Corporation.

The gasholder at Auchinleck, the capacity of which is 33,500 cubic feet, is now completed; and a great improvement in the gas supply of this town has resulted. It holds more than twice the quantity of gas contained in the other two holders. Mr. Hugh Devine, who has been Manager of the gas-works for many years, designed the holder, which was erected by Messrs. Robert Dempster and Sons, Limited.

The shareholders of the Methven Gas Company have agreed to accept the offer of the Perth Corporation for their undertaking, and to continue the supply of gas pending the introduction of Perth gas. They have also agreed to present an honorarium not exceeding £25 to Mr. Thomas Smith, the Manager, for his long and faithful service.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *March 29.*

The following is the position of the chief tar products in the London market: Pitch freights are reported easier, but there is little tonnage available, and, moreover, the end of the shipping season is not far distant. The value of the article for export remains steady at about 23s. per ton, but rather higher prices are obtainable for home trade. Local authorities are already ordering forward part of their requirements of pitch and tar for road work. Solvent naphtha continues in good demand. Sixties crude carbolic acid is firm at 3s. 5d. to 3s. 6d. per gallon, casks free (we hear that the authorities may take steps to control the output of this article). Motor benzol is 1s. 2d. per gallon, net, at depôts; 40-45 per cent. anthracene, 2¼d. per unit, casks free; creosote firm at 4$\frac{1}{16}$d. to 4$\frac{1}{8}$d. per gallon, net and naked, at works; pyridine is called 8s. 3d. per gallon net, into buyers' drums, but there is not much demand.

Twenty-five per cent. sulphate of ammonia is still called £13 12s. 6d. per ton, net and naked, at makers' works; but the position is if anything slightly easier.

Manchester Tar Prices.

We have received from Mr. S. E. Halliwell, the Hon. Secretary of the Lancashire Commercial Section of the Manchester District Institution of Gas Engineers, a report as to liquid products in the tar sold by their members during the six months to December last. It is as follows.

The average prices realized as the gross value of liquid products (without deductions for working expenses or discount) in the Manchester district were as follows:

July	23/1 per ton	October . . .	26/7 per ton
August . . .	25/4 „	November . .	27/9 „
September . .	25/7 „	December . .	28/3 „

Mr. Halliwell adds that he has not yet received the complete lists for January and February, but will report in due course.

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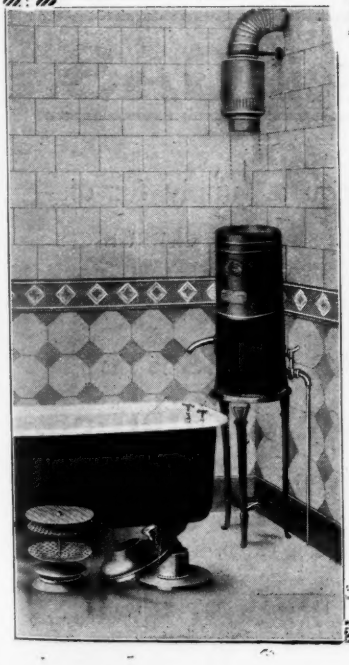

1. Can be inspected and *all* water ways and gas ways thoroughly cleaned *in situ*—every part of the interior being readily accessible.
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Tar Products in the Provinces.

March 29.

The markets for tar products have remained about the same throughout the past week. There has been a little inquiry for pitch, but the orders placed do not seem to have affected the market in any way. Benzols are fairly steady, and business is reported at the equivalent of to-day's prices. Solvent and heavy naphthas are in good demand, and some high prices have been paid. Crude carbolic has been quieter than the previous week, though, of course, the market is very steady. Fair quantities of creosote have been offering at very reasonable prices.

The average values of gas-works products during the past week were: Tar, 21s. to 25s.; pitch, East Coast, 17s. to 17s. 6d.; West Coast, 18s. to 19s., Manchester; 19s. to 19s. 6d., Liverpool; 20s. 6d. to 21s. Clyde. Benzol, 90 per cent., naked, North, 9½d. to 10½d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 2d. to 2s. 4d. Crude naphtha, in bulk, North, 5¼d to 5⅝d. Solvent naphtha, naked, North, 1s. 5d. to 1s. 6d. Heavy naphtha, naked, North, 11d. to 1s. Creosote, in bulk, North, 3d. to 3⅛d. Heavy oils, in bulk, 3⅜d. to 4d. Carbolic acid, casks included, 60 per cent., East and West coasts, 3s. 4d. to 3s. 5d. Naphthalene, £8 to £16; salts, 65s. to 70s., bags included. Anthracene, "A" quality, 2d., "B" nominally, ¾d. per unit.

*** A list giving the full value of tar, including pitch, for the period from Aug. 17, 1914, to March 22 last, will be found on p. 792 of this issue.—Ed. J.G.L.

Sulphate of Ammonia in the Provinces.

Liverpool, *March* 27.

There is no new feature to comment upon in the market, and values have remained unchanged throughout the week. The prohibition of the export of this article can be largely overcome by obtaining Government licences; but the congestion on the railways and at the docks is still a very serious factor in the situation. Quotations are repeated at £13 10s. per ton f.o.b. Hull, £13 10s. per ton f.o.b. Liverpool, and £14 per ton f.o b. Leith. No further business has transpired in the forward position, but producers have continued very firm in their views at £13 2s. 6d. to £13 5s. per ton f.o.b. at the ports for July-December delivery.

Nitrate of Soda.

The market for this material is also without alteration, and spot prices are well maintained at 11s. 6d. per cwt. for ordinary, and 12s. for refined quality.

Sulphate of Ammonia.

From another source it is reported that the market for this article has been very quiet throughout the past week, and the doubt as to the export licences has very probably affected transactions for the time being. Outside London, makes are quoted at £12 17s. 6d.; Leith, £13 17s. 6d.; Liverpool, £13 16s. 3d. to £13 17s. 6d.; Hull, £13 12s. 6d. to £13 15s.; Middlesbrough, £13 12s. 6d. to £13 15s

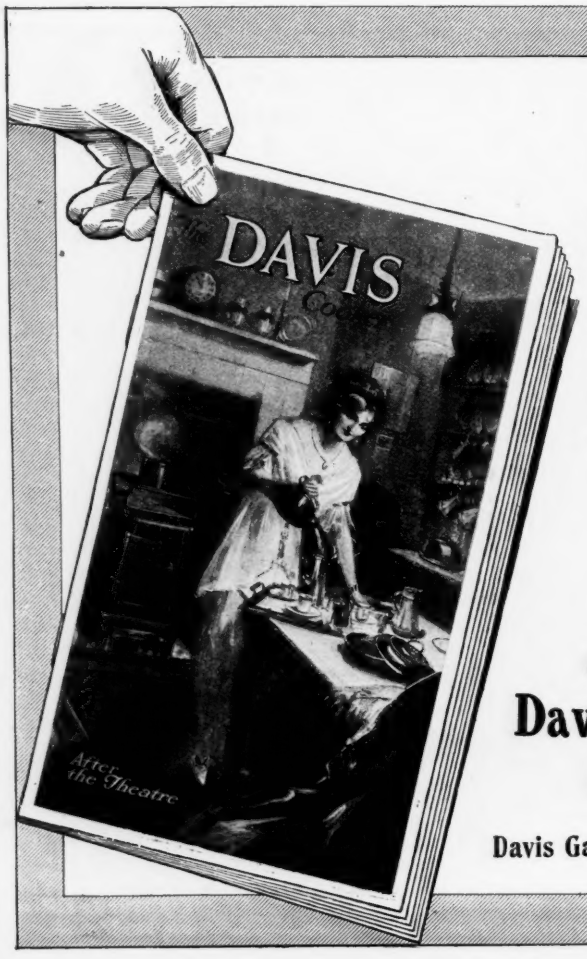
COAL TRADE REPORT.

Northern Coal Trade.

The northern coal trade is active, and there are some advances in the price of fuel. But, on the other hand, steamer tonnage is for the present more plentiful, and rates of freight show some weakness. In the steam coal trade, there is a full demand, with prices firm at recent advances. Best Northumbrians are about 30s. per ton f.o.b., with second-class steams at 25s. to 27s. per ton; and steam smalls are from 13s. 6d. to 15s. per ton. Sales are not in heavy quantities at present; and much of the coal that is being sent out is on lower-priced contracts. The gas coal trade shows fuller exports; and as there is little coal free for delivery until after the holidays, the prices are higher for any lots available for prompt dispatch. Best Durham gas coals are from 22s. per ton f.o.b., with second-class kinds as high as 20s. "Wear Specials" are scarce and dear, and any sales are mostly for forward delivery. Freights of coal are now decidedly lower—gas coal to London being perhaps from 7s. 6d. to 8s. per ton; so that the higher price of the fuel is to some extent minimized. Although collieries will try to shorten the holidays, it must be expected that the output of coal will be less for the next week or so. Coke is dearer; and this affects gas coke, more especially as the latter is now in reduced production. The price of gas coke varies a great deal; but for export, about 15s. may be put as the f.o.b. price on the Tyne for good makes.

A Creosote Fire.—The works at Middlesbrough of the Coal Distillation Company were the scene of a fire on Monday night of last week. Five tanks containing each 9000 gallons of creosote caught fire, and the flames spread to a building used for separating the oil from the tar. The fire brigade were called out, and with great difficulty got the flames under control.

Water-Fitting Job Dispute.—The Stationery Office, near the Waterloo Terminus, is being converted into a temporary war hospital for wounded British soldiers, and work is being seriously delayed owing to a dispute as to what grade of workman shall fit up the water supplies. The contractors have employed fitters, and the plumbers engaged by the same firm went on strike a few days ago because they maintained it was their work. Previously, the officials of the Operative Plumbers' Association had made unavailing efforts to secure an amicable settlement. The Government Committee on Production considered the matter, and it was agreed that the men should return to work pending the settlement of the demarcation question. When they presented themselves they were refused access to the job. The other plumbers employed by different contractors on another class of work consequently struck work in sympathy.



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Davis Gas Stove Co., Ltd., London, Luton, Manchester, Paris.

The Question of Munich Chambers for Stockport.

In connection with the matter referred to in a paragraph headed "An Application to Use German Patents," in our "Legal Intelligence" last week (p. 759), currency was given to the following statement in the "Stockport Advertiser" and other papers: "In order to be in a position to supply a £50,000 gas installation to the Stockport Gas Committee, Mr. S. N. Wellington, gas engineer, of Mincing Lane, London, applied in the Patents Court, London, for a licence to use half-a-dozen German patents for what is known as the Munich chambers for gas making. The applicant said Messrs. R. & J. Dempster, of Manchester, were to instal the plant, which was to be entirely British made." In a letter addressed to the above-named paper, Mr. John Noden called attention to the statement, and said: "From the reading of the same your readers may be under the impression that the Stockport Corporation have decided to instal the Munich chamber system for gas making. May I be allowed to say that as yet the Stockport Corporation have not considered the question? The Gas Committee themselves have not even yet considered it; the matter being entirely at the moment in the hands of a Sub-Committee of the Gas Committee appointed to deal with the subject, who have not yet issued their report. The latest phase is that the tender submitted some months ago by Messrs. R. & J. Dempster, of Manchester, for the erection of the plant, has been unreservedly withdrawn. I just desire to give the above facts, in case any of your readers may think the Munich chamber system has been adopted, and will shortly be installed at the Stockport Gas-Works, without any consideration by the Town Council."

Worksop Council's Undertakings.—A substantial sum in alleviation of local burdens was reported at the last meeting of the Worksop Urban Council as being likely to accrue during the ensuing half year from the electricity, water-works, and other undertakings; the amount being estimated at £7300.

Windsor Royal Gas Company.—At the half-yearly general meeting of this Company last Wednesday, the Directors reported that the works and plant (under the supervision of Mr. H. Buckley, the Engineer) were in good order, and that the private sales of gas showed an increase over the second half of 1913, sufficient to meet the reduction of 2d. per 1000 cubic feet in the price of gas which came into effect on Jan. 1, 1914. The profit on the revenue account was £2014. The Chairman (Dr. W. B. Holderness), in moving the adoption of the report, drew attention to the fact that during the last fourteen years the price of gas had been reduced by 10d. per 1000 cubic feet, which meant a saving of £4000 a year to the consumers. Dividends at the rates of 5, 10, and 7 per cent. per annum were declared on the preference, ordinary, and new shares; and the meeting closed with votes of thanks to the Engineer, Secretary (Mr. W. E. Free), and staff, and also to the Chairman and Directors.

Hobart (Tasmania) Gas Company.

At the last half-yearly meeting of this Company, the Directors reported a balance of £6637, out of which they recommended the payment of a dividend of 16s. per share. This would absorb £4800, and after other payments had been made there would be left £597 to be carried forward. The Chairman (Mr. J. Murdoch), in moving the adoption of the report, congratulated the shareholders on another prosperous half year. The sales of gas by meter amounted to 59,097,200 cubic feet; being an increase of 3,064,200 cubic feet on the corresponding period of 1913. The demand for gas for cooking and heating purposes was still growing; the sales from these sources representing 47 per cent. of the total output. In January last their Consulting Engineer (Mr. Philip C. Holmes Hunt, M.Inst.C.E.) was in Hobart, and visited the property purchased at Moonah in July last, with the view of eventually using it for the erection of new works. Mr. Hunt considered the situation excellent in every respect; and he was engaged in preparing preliminary plans and estimates. The electricity branch of the business was steadily progressing; the receipts for current sold in the half year showing an increase of £1806 over those of the corresponding period of 1913. The total revenue from the supply of electricity amounted to £16,000, and there was every reason to look forward to a substantial increase in the future. On the 1st of October the marine suburbs of Bellerive and Lindisfarne were lighted by electricity; and the installation had given entire satisfaction to the residents. In addition to the street lighting, 107 establishments had been supplied up to the end of the year, and consumers were being daily connected. In conclusion, the Chairman said it was with deep regret that he referred to the death quite suddenly of the late Secretary (Mr. A. E. Chancellor), who had been associated with the Company for thirty years. Mr. F. W. Reid, who entered their service in 1900, had been appointed his successor. The report was adopted.

Imperial Continental Gas Association.—The Secretary of the Association (Mr. R. W. Wilson) announces that, though, owing to the absence of returns from the stations, it will not be possible for the Directors to prepare a report and balance-sheet, &c., for the half year ended the 31st of December, they will, at the meeting to be held on the 4th of May, recommend a distribution of 2¼ per cent., subject to deduction of tax, from the reserves.

Rockhampton Gas Company.—The accounts of the Company for the six months ended Dec. 31, which were submitted at the recent meeting, showed that the profits for this period amounted to £4232, which, with the balance forward, left at the credit of the profit and loss account £6232. After applying £1438 to writing-down the assets, the Directors recommended the payment of dividends at the rate of 9 per cent. per annum on the preference shares and 7 per cent. per annum on the ordinary shares, which would leave £3000 to be carried forward.

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Mansfield Gas Undertaking.

The probability of an increase in the price charged for gas at Mansfield was indicated at the last meeting of the Town Council by the Chairman of the Gas Committee (Mr. T. Smith), who doubted the possibility of going on much longer at the present rates. It had, he said, been decided to raise the price of coke by 2s. 6d. per ton; and this would help to some extent in meeting the larger expenses involved. Some 18,000 tons of coal would be needed to meet next year's requirements, and they expected the price would be up by 4s. to 5s. a ton, which would mean that they would have to pay £4500 more for coal. The profits of the undertaking were from £2000 to £3000; and they would have to get the remainder from somewhere. Replying to certain questions which were put by Mr. Houfton, he explained that at the end of 1912 the amount of coal carbonized was 15,608 tons, averaging 10,452 cubic feet of gas per ton. They expected to carbonize 17,051 tons for the year now nearly completed, which would give them 12,200 cubic feet—a great increase. In reference to the rise in the price of coke, Mr. Johns raised the question whether any special arrangements had been made as to bakehouses, pointing out that the present price of bread was high, and an increase of 2s. 6d. a ton on coke would tend to make it even dearer. Mr. Smith replied that the Committee had gone into all these points. It was a matter of which was the least evil. The next alteration would interfere with everybody, because the price of gas would have to be raised. The public and the poorer portion of the community would benefit more by keeping the price of gas as it was than by retaining coke at the old figure.

Prepayment Meter Thefts at Manchester.—At the Manchester Quarter Sessions on Tuesday last, Cecil Harrison (16) was sent to a Borstal Institution for two years for damaging a prepayment meter and stealing 5s. 11d. A sentence of three years' Borstal treatment was meted out to George Collins (16) for a like offence; defendant pleading guilty to damaging property in the house and stealing 2s. 10d. and 4s. 6d. from the prepayment meter.

Salford Ratepayers and the Price of Gas.—Reference was made at the annual meeting of the Salford Ratepayers' Association to the increased price of gas; the Chairman (Mr. J. W. Cooke) remarking that a thoroughly commercial depreciation fund and an adequate reserve fund built up in good times would have enabled the Corporation to have met these unusual times without resorting to increased prices. The creation of such funds, he added, was the axiom of all business concerns. It was a lamentable state of things for an undertaking which had involved a million of money. Mr. O'Neill (the Elective Auditor) referred to the fact that the Gas Committee could this year only hand over £10,000 of their profits to the relief of the rates. The Electricity Committee would contribute nothing; so that £10,000 was all they would get from two undertakings which had been capitalized at over £1,600,000. He thought it was a "great disgrace."

Improved Gas Appliances Required in Japan.

Under the heading of "Investigation of Light and Heat Appliances," the following remarks appeared in the last number of the "Journal of the Imperial Gas Association" over the signature of the Editor, Mr. S. Inubushi: "The manufacture of gas appliances and fixtures in Japan has made such strides that their importation in any great number is not required. However, these fixtures still follow the patterns of foreign goods. They are lacking in originality, and are not in keeping with our style of building, habits, or customs. This no doubt greatly retards the general use of gas in our households—a condition that should be remedied at once, in order to further the development of gas consumption, thereby greatly benefiting the interests of our gas men. They should see that here is a great opportunity being lost that should be grasped and made to serve their interests. We must admit that both gas men and manufacturers of fixtures and appliances are working along this line; but, so far, nothing has been produced that fully meets the requirements mentioned. Thoughtful persons are considering this condition seriously; and there is no need to further emphasize the fact that the imported articles are not suitable to our household requirements. An improvement along this line will not only do away with the many inconveniences experienced, and greatly add to the comfort of the daily life of our people, but will promote the general welfare of the gas industry. . . . The need for such an investigation has been felt for some years; but no prominent organizer has come forth to carry it through. The Tokyo Gas and Electric Light Company, Limited, has, however, recently organized a Department of Investigation for Light and Heat Appliances, which cannot but be heartily welcomed. The aims of this organization are to supply only such fixtures as will meet the needs of the community from the standpoint of convenience and economical values befitting the habits and customs of each separate community, since these habits and customs differ in each area of the Empire."

Bendigo Gas Company.—The report presented at the half-yearly meeting of the Company stated that the profit and loss account showed a balance for the six months of £2107, which, added to the amount brought forward, gave a sum of £9724. Out of this the Directors recommended the declaration of a dividend of 4s. per share for the half year ended Dec. 31. Various extensions have been carried out, to meet the demands of new customers; and others are in contemplation.

Imprisonment for Gas Stealing.—For stealing gas valued at £2 from the Liverpool Gas Company, Vincent M'Evoy was, at the local Police Court last week, sentenced to six weeks' imprisonment. The usual piping to the meter in his house had been removed, and a tube substituted, so that the gas did not go through the meter. It was stated that there had been a number of similar cases, and it been customary to take a course which allowed of a £5 maximum penalty; but as this did not seem to do any good, it had been decided to inflict imprisonment in the present case as a warning.

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Auckland (N.Z.) Gas Company, Limited.

The report presented by the Directors of this Company at the last annual meeting showed that the profits for the twelve months ended Dec. 31, 1914, amounted to £60,008. Adding the balance brought forward, less the dividend paid in February last year, there was a sum of £79,548 standing to the credit of the profit and loss account. From this was taken the interim dividend paid in July (£25,040); leaving £54,508 for disposal. The Directors recommended a dividend for the second half of 1914 of 11d. per share on the £1 fully-paid shares, and a proportionate dividend on those on which 7s. has been paid. These payments would absorb £25,696, and leave £28,812 to be carried forward. The Chairman (Mr. J. H. Upton), in moving the adoption of the report, said there was an increase of £19,815 in the amount received for gas sold by meter, and £2675 in that produced by the sale of residuals. The number of new accounts opened during the year was 1280; bringing up the total to 26,995. The expenditure on capital account had been £46,454; making a total of £809,736. Under the supervision of the Engineer (Mr. James Lowe, Assoc.M.Inst.C.E.), the mains had been extended by 31 miles; the total length at the close of the year being 401 miles. The number of gas-stoves in use at that date was 10,692, or 1421 more than at the close of 1913. For some years the Directors had sold the coke by contract; but they decided to resume the distribution of it themselves as from last December. The report was adopted.

Londonderry Gas Company.—At the annual meeting of the Londonderry Gas Company, Mr. H. J. Cooke expressed regret that, owing to bad times, there was a reduced dividend—7½ per cent. on the original stock and 5¼ per cent. on the new shares. There was a large reduction in output, in consequence of slackness of business in the city. He announced that between 40 and 50 per cent. of the Company's men had volunteered for the front.

Rochdale and the "£ s. d." of Reduced Lighting.—According to a report presented to the Gas Committee at Rochdale, the number of street lamps which are left unlighted each night under the Military regulations is about 1400. This represents a depreciation in revenue of from between £30 and £40 per week. As a test, some of the lamps in the centre of the town have been black-enamelled on the top; but up to now the Manchester plan of enamelling the sides also, to the level of the light, has not been adopted.

Increase in the Price of Gas.—In addition to the other Surrey gas companies who have raised their price, the Woking Company have put on 6d. per 1000 cubic feet, which it is stated will only be about two-thirds of the additional amount that has now to be paid for coal. The Longwood and Slaithwaite Gas Company have given notice that from next Thursday the price per 1000 cubic feet of gas will be increased as follows: Slaithwaite gas area, 2d.; Longwood gas area, 3d. Present prices are: Slaithwaite, 2s. 11d.; Longwood, 2s. 6d.

Devon Gas Association, Limited.

The ninth annual meeting of the Association was held on Monday of last week, at Exeter, under the presidency of Mr. F. Templer Depree, J.P. In moving the adoption of the report, the Chairman referred to the troublous times through which gas undertakings—but particularly those far removed from the coalfields—had been passing, and said that the slight increase on revenue account was really, in the circumstances, a gratifying feature. The increased cost of manufacturing gas caused directly by the war was now from 10d. to 1s. per 10:0 cubic feet; and though the Directors did not propose to ask the consumers to pay all this, it would be necessary to increase the price in the near future. Additional sales of gas and improved working results had hitherto obviated the necessity of any increase in gas prices. The former still continued, and the keenest attention will be paid to the latter, and any economies possible to prevent further rise. High coal prices had, however, once again brought home to the public the reliability and convenience of the gas-cooker; and the Association's present increased output was directly traceable to this. During the year the Sturminster Newton works, previously leased, had been purchased outright, and the reconstruction of the plant completed. The number of consumers had increased by 121; and the gas sold had increased by 8 per cent. In seconding the motion, Mr. R. J. Rew said that the Association used every possible endeavour, by improved method of production, to counteract the heavy increase in the cost of raw materials. The make of gas per ton of coal carbonized had been increased 565 cubic feet. The extra cost of coal between the years 1910 and 1914 equalled half the amount now required to pay the dividends. Considerable capital had been expended, but always with the aim in view of cheapening production. The report was adopted, and the usual dividend of 5 per cent. (less income tax) was declared.

Bradford Municipal Undertakings.—A correspondent writes that the outlook of the Bradford Gas Department, so far as the statement regarding the past year's working is concerned, is by no means rosy. Locally the gas undertaking has, in the past, been looked upon as one from which large contributions in relief of rates could be expected. Last year, for instance, a sum of £5000 was appropriated for this purpose; but the past year has been a very hard one for the Gas Department. Instead of a profit from the undertaking, it is expected this year that there will be a deficit of something like £25,000; and it is even stated that the Gas Committee will consider themselves fortunate if the deficit does not exceed this figure. The principal causes of this state of things are the increased price of coal and the reduced revenue obtained from the sale of residuals. The Electricity Department has also been hard hit, but not nearly to the same extent as the gas undertaking. The Water Department, which last year contributed £10,000 to the relief of rates, is expected to show a substantial decrease in profits at the year end, by reason of trade dislocation and the growing capital charges upon extensive new undertakings.

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Hinckley Water-Works Progress.

Interesting statistics relative to the Hinckley Water-Works are contained in the annual report of the Engineer (Mr. E. H. Crump). Last year the total number of gallons used by a population of 13,156 was 102,370,540, or an average of 280,467 gallons a day, and 21·17 gallons per head. Ten years ago the consumption was 63,366,324 gallons; the population then being 11,865—an average of 14·6 gallons per head per diem. Last year an additional 7,410,000 gallons were supplied to the neighbouring villages of Barwell and Earl Shilton; while the Electric Power Company's supply was 6,696,000 gallons. The expenditure on the water undertaking last year was £4371, including £2561 for interest and sinking fund, against £2880 in 1904; while the receipts totalled £4411, as compared with £2998 ten years ago. During the year, both engines at the Snareston pumping-station had been fitted with new pumps, each of which could lift 550,000 gallons per diem of 24 hours, instead of 360,000 gallons as previously. As the average daily quantity pumped was about 370,000 gallons, there was ample margin for some years to come. Credit was due to Mr. Woolstan and his staff for bringing the work to its present satisfactory condition. The total quantity of water consumed per head per diem for all purposes was 21·03 gallons, and for trade purposes 6·41 gallons. This gave a net quantity of 14·62 gallons for domestic purposes alone, which, in his (the Engineer's) opinion, was a very reasonable amount—especially as Hinckley was a manufacturing district. The waste of water had not been excessive; and this he attributed to systematic inspection. The time had now arrived when he thought that all additional large expenditure in connection with the works would cease, as the supply was fairly constant, and the plant was quite sufficient. The returns should consequently begin to show a substantial profit.

Barnard Castle Gas Company.—The eighty-first annual general meeting of the Company was held last Friday—Mr. R. T. Richardson, J.P., presiding. In the course of his remarks, he said a check in the ordinary consumers' consumption was balanced by an increase in that of the prepayment consumers. The former was fully accounted for by the reduction in the consumption of a large school, where a heavy leakage had, with the Company's assistance, been discovered and stopped, with subsequent careful oversight. Discontent was thereby averted. The Chairman complimented the Secretary (Mr. Robert Wood) on having successfully carried through a claim for an annual depreciation allowance, whereby this year's assessment for income-tax was reduced by over one-third. The report of the Works Manager (Mr. O. Sissons) showed that the cost of coals had greatly increased; yet the Directors had so far been able to avoid raising the price of gas. The balance available justified them in paying the usual dividends of £5 and £3 11s. 5d. per cent. per annum, free of income-tax, on the original and new stock respectively; and these were accordingly declared. The Cotherstone extension again showed a gratifying increase of 23 per cent. in the consumption.

An Increase at Kingston.—The Kingston-on-Thames Gas Company announce that, owing to the advance in the price of coal and freight charges, they will increase the price of gas from 2s. 6d. to 2s. 10d. per 1000 cubic feet, commencing this quarter.

Large Theft of Gas.—Probably the largest theft of gas ever recorded is that alleged in the suit of the Public Service Gas Company against a consumer in Jersey City (N.J.), for 5,216,700 cubic feet of gas taken since 1907 through a connection from the service-pipe. According to the "American Gas Light Journal," it is alleged that, from June 1, 1907, to Jan. 28, 1915, the defendant "consumed, with intent to defraud," the gas of the Company in the operation of a steam-boiler, heating-plant, gas-range, and gas-light.

Maryborough (Queensland) Gas Company, Limited.—The profits of the Company for the half year to Dec. 31 (after making provision for bad and doubtful debts, repairs and renewals, depreciation, working expenses, wear and tear, and other charges), including the balance brought forward, amounted to £1255; and at the shareholders' meeting on the 18th ult., the Directors recommended the payment of the usual dividend of 6 per cent. per annum, free of income-tax. This would absorb £990, and leave £265 to be carried forward.

Probable Increase in Price of Manchester Gas.—At the week-end the Manchester Gas Committee had not arrived at any definite decision regarding the question of increasing the price of gas to their consumers. There is no doubt, however, says our correspondent, that the increased prices demanded on coal contracts leaves the Committee with very little option. A sum of £50,000 has to be contributed by the Gas Department towards the relief of the rates, and with everything costing more, and the price of residuals falling, an advance in the price of gas appears inevitable. Inquiry at the Gas Department, however, resulted in a statement being made that at present no official news could be given.

Launceston Public Lighting.—At a meeting of the Launceston Town Council, considerable discussion took place on a report by the Lighting Committee. The report dealt with the bill of the Gas Company for the half year ended the 2nd ult., amounting to £75 for gas consumed in the public lamps, as compared with £56 for the corresponding period of the previous year. The Committee regretted that the Gas Company had not read the meters month by month, as provided by the contract, and recommended alterations in the governors. The lighting of each lamp by gas for the last six months was at least £1 more than the cost per lamp of lighting by electricity. If the meters had been read monthly, this question would have been investigated long ago. Mr. Fraser thought it a matter for compromise; and Dr. Thompson suggested that a Sub-Committee of the Lighting Committee should confer with the Directors of the Gas Company. Mr. M'Donald strongly objected to this action. He said the gas had been registered through the meters, and the Council should pay the cost. The report was passed, and the bill was ordered to be paid.

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Abstracting Water from a Hydrant.

At the Manchester Police Court on Saturday an unusual prosecution respecting the unauthorized use of water hydrants in the city was decided; Messrs. H. N. Morris and Co., chemical manufacturers, of Miles Street, West Gorton, Manchester, and their Manager, Mr. J. Charlton, being summoned for interfering with a hydrant and extracting water therefrom. Mr. A. F. Pickford, of the Town Clerk's Department, said that a water inspector found a standpipe fixed to a Corporation hydrant in Miles Street, outside the defendants' works, with a length of fire hose attached leading to the works. Mr. Charlton was seen, and he explained that a pipe had burst on the premises, and that the water supply had been cut off. They were, he said, carrying on some important work, and had fixed the standpipe in order to get the necessary water supply. The Stipendiary Magistrate (Mr. Edgar Brierley) said the firm ought to have obtained permission from the Corporation before attaching the pipe. A fine of £5 and costs was imposed upon each of the defendants.

The Treasury and Municipal Borrowing.—A communication from the Treasury to the London County Council, and standing upon the *agenda* for to-day's meeting, indicates that consent will not be given to any municipal expenditure which is not really necessary in the national interests. The Treasury cannot even sanction the Council's tramway schemes, involving a capital expenditure of £250,000, and the slowing-down of any municipal works now in progress is suggested. While the Treasury are not prepared to insist that their approval should be obtained in all circumstances before money is borrowed by borough councils from their bankers, they desire it to be understood that if a council insists upon incurring capital expenditure against the wishes of the Treasury, who are acting with a view to the general interests of the nation in existing circumstances, sanction will not be given by them or by the Local Government Board in the case of any further application for approval of borrowing for any purpose whatever.

Remarkable Electricity Scheme.—Some details are published of a scheme which has been formulated by a private company for generating electric current at Belleek (co. Fermanagh), by the waters of Lough Erne, and at Limerick, by the waters of the Shannon, for the supply of towns, villages, and country houses throughout Ireland—not in competition with existing electric lighting companies, but to give power to other companies at present cost of production. There would, however, be competition with gas companies in many of the smaller towns. It is stated that the capital, between £1,000,000 and £2,000,000, has been already guaranteed.

Increased Electric Light Charges.—It is reported that the Directors of the various electric lighting companies in London have decided to raise the price of current by ¼d. per unit, or an all-round increase of 10 per cent., as from next Thursday. According to a paragraph in "The Times," the reason given for this step is the freight rate on coal, which has put up the cost of supply by about 40 per cent. In addition, the electricity undertakings say they have had to meet an extra cost of 10 per cent. on their labour bills in the shape of a war bonus. This they will pay out of profits; but the increased cost of production represented by coal they propose to get back from the consumer.

Haywards Heath Gas Company.—In the report which was adopted at the half-yearly meeting of the Company, the Directors recommend dividends for the six months ended Dec. 31 which would make 13¾ per cent. for the year on the original capital and 9⅝ per cent. upon the additional capital—leaving £2851 to be carried forward. The Chairman (Mr. C. Charleton) said, not only had the period covered by the accounts been better than they could have expected, but the increased business in the present year was already phenomenal. They had been obliged to raise the price of gas 3d. per 1000 cubic feet, which was for the time being sufficient, though it did not cover the increased cost entailed upon them by the price of coal, &c. Nobody seemed to have the smallest objection to the increase they had made; for they were following the lead of companies all over the country.

GAS COMPANIES IN THE STOCK EXCHANGE.

Business on the Stock Exchange continued to be quiet, although perhaps showing a shade or two more animation than the preceding week. It became apparent that the reduction in the minimum prices which had been so urgently demanded has not yet had the anticipated and hoped-for result of stimulating enterprise and activity. Perhaps it has not yet had time enough to fructify; but at present the position is disappointing. But although the business of the week was deficient in volume, the tone was fairly good in general, and even quite cheerful in some particular lines. The plum in the week's war news was, of course, the fall of Przemysl—the greatest achievement yet in the gigantic struggle, and one perhaps fraught with the weightiest consequences. Against this, the only partial success of the Government in composing the labour unrest was an item in the opposite scale. In effect, the higher classes of securities were firm, and Americans fairly good; while, in more speculative lines, oils and warlike commodities and munitions were in demand. Business in the Gas Market was quieter than ever; the general rise in the price of gas, with its concomitant reductions in dividend wherever the sliding-scale obtains, giving occasion to pause and consider the positions before either buying or selling. As a general rule, the average quotations of the preceding week were hardly changed, if at all. With regard to dealings in the Brentford Company's issues, be it noted that, by their new Act, the consolidated is now a 4 per cent. stock, and the new a 3½ per cent. stock.

Bargains done for cash during the week were as follows: On Monday, Brentford new 93, 93½, British 41¼, Croydon 215, Gas Light ordinary 86, 87, ditto preference 86, Primitiva preference 4 9/16, South Metropolitan 91¾, 91½. On Tuesday, Bournemouth preference 13, Gas Light preference 85, 85¼, ditto debenture 63¾, 70, Imperial Continental 83¾, Primitiva 4⅝, ditto preference, 4½, 4⅝, South Metropolitan 93. On Wednesday, British 40⅜, 40⅝, Gas Light ordinary 86, ditto preference 85, 85¼, South Metropolitan 91. On Thursday, British 40⅞, Commercial old 97½, 99, ditto debenture 70, Newcastle 92½, South Metropolitan 91½, 92, 93. On Friday, Liverpool 101, Primitiva 4½, ditto preference 4¼, 4 9/16, 4⅝, South Metropolitan 91, 91½. On Saturday, Bournemouth "B" 13¾, ditto preference 12¾, Gas Light preference 85½, ditto debenture 69¼, 69½, 69¾.

Bank rate (fixed Aug. 8) 5 per cent.; last year, 3 per cent.

LOWEST AND HIGHEST PRICES OF BARGAINS DONE FOR CASH IN THE WEEK ENDING MARCH 27.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p c			£ s. d.	
1,551,808	Stk.	April 8	2½	Alliance & Dublin Ord.	59 –64	3 18 2	..
374,000	,,	July 10	4	Do. 4 p.c. Deb.	76 –79	5 1 3	..
380,000	5	April 29	7½	Bombay, Ltd. . . .	5½–6⅝	5 17 8	..
60,000	10	Feb. 26	16	10 p.c. . .	29 –30	5 6 8	..
378,480	10		7	Bourne- { B 7 p.c. .	15 –15½	4 10 4	⅜⅜
95,000	10		6	mouth Gas and Water { Pref. 6 p.c.	13½–14	4 5 9	12¾ –13
—	—	—	—	Deb. . .	..	—	.
880,000	Stk.	Feb 26	14	Brentford Consolidated	261–266	5 5 3	..
330,000	,,	,,	11	Do. New . . .	204–209	5 5 3	93–93½
50,000	,,	,,	5	Do. 5 p.c. Pref. .	109 –111	4 10 1	..
306,250	,,	June 11	4	Do. 4 p.c. Deb. .	91 –93	4 6 0	..
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig	208 –213	5 3 4	..
944,200	,,	,,	8	Do. A Ord. Stk. .	154 –159	5 0 8	..
630,000	20	Mar. 26	12½	British	44 –45	5 11 1	40⅞–41½
120,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88 –93	4 8 11	..
945,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb	85 –87	4 12 0	..
100,000	10	—	—	Cape Town & Dis., Ltd.	1½–2½	—	..
100,000	10	—	—	Do. 4½ p.c. Pref. .	4 –6	—	..
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	70 –75	6 0 0	..
157,150	Stk.	Feb. 26	6	Chester 5 p.c. Ord. . .	104–110	4 10 11	..
1,513,260	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106–108	5 1 2	97½–99
560,000	,,	,,	5½	Do. 3½ p.c. do. .	103 –105	5 1 6	..
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	69½–71½	4 3 11	70
300 000	Stk.	,,	4	Continental Union, Ltd	76 –79	5 1 3	..
200 000	,,	,,	7	Do. 7 p.c. Pref.	115 –118	5 18 8	..
—	—	—	—	Croydon B and C 7 p.c.	..	—	215
472,270	Stk.	—	6	Derby Con. Stk. . . .	123–125	4 16 0	..
65,000	,,	—	4	Do. Deb. Stk. .	102–104	3 16 11	..
1,092,180	10	July 29	10	European, Ltd. . . .	17½–18	5 11 1	..
16,364,910	Stk.	Feb. 12	4/17/4	Gas { 4 p.c. Ord. . .	98 –102	4 15 6	86–87
2,600,000	,,	,,	8½	Light { 3½ p.c. max.	76 –79	4 8 7	..
4,062,335	,,	,,	4	and { 4 p.c. Con. Pref.	96 –99	4 0 10	85–86
4,674,850	,,	June 11	3	Coke { 3 p.c. Con. Deb.	72½–74½	4 0 6	69¼–70
268,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87 –89	5 12 4	..
70,000	10	April 29	11	Hongkong & China, Ltd.	16½–16¾	6 11 4	..
—	—	—	—	Hornsey 7 p.c. . . .	..	—	..
131,000	Stk.	Mar. 12	7⅞†	Ilford A and C . . .	151–154	5 2 4	..
65,780	,,	,,	6⅜†	Do. B	115–118	5 8 0	..
95,500	,,	June 26	4	Do. 4 p.c. Deb. . .	92 –94	4 5 1	..
4,940,000	Stk.	May 14	9	Imperial Continental .	150–160	5 12 6	83½
1,395,000	Stk.	Feb. 12	8½	Do. 3½ p.c. Deb. Red.	84 –86	4 1 5	..
200,342	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c..	119–121	5 7 5	..
861,000	Stk.	Feb. 26	10	Liverpool 5 p.c. Ord. { A	211–213	4 13 11	101
718,100	,,	,,	7	{ B	146–148	4 14 7	
306,083	,,	June 26	4	Do. 4 p.c. Pr. Deb. Stk.	..	—	..

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d.	
75,000	5	June 11	0	Malta & Mediterranean	4⅛ –4⅝	6 9 9	..
250,000	100	April 1	4½	Met. of { 4½ p.c. Deb. Melbourne	99 –101	4 9 1	..
541,920	20	May 28	4	Monte Video, Ltd. . .	11½–12	6 13 4	..
1,775,892	Stk.	July 29	4½	Newc'tle&G'tesh'd Con.	93½–99½	4 10 6	92½
529,705	Stk.	June 26	3½	Do. 3½ p.c. Deb.	82 –83	4 4 0	..
55,940	10	Feb. 26	7/14/0	North Middlesex 7 p.c.	14 –15	5 2 8	..
300 000	Stk.	May 14	8	Oriental, Ltd. . . .	117–122	6 11 2	..
60,000	5	Mar. 26	10	Ottoman, Ltd. . . .	7½–7⅝	6 9 6	..
60,000	50	Feb. 26	18	Portsea, Island B . .	123–131	4 19 3	..
100,000	50	,,	12	Do. C . .	118 –121	4 19 2	..
249,980	5	April 29	8	Primitiva Ord. . . .	5⅛–6	6 18 4	4½
499,960	5	June 26	5	,, 5 p.c. Pref. .	4⅜–5	5 0 0	4½–4⅝
521,600	100	June 2	4	,, 4 p.c. Deb. .	91 –93	4 6 0	
—	—	—	—	,, ,, ,, 1911	..	—	
346,198	Stk.	June 26	4	River Plate 4 p.c. Deb.	85 –87	4 12 0	..
150,000	10	May 14	6	San Paulo { 6 p.c. Pref	10½ –11	5 9 1	..
125,000	50	July 1	5	{ 5 p.c. Deb.	47 –49	5 2 0	..
135,000	Stk.	Mar. 12	10	Sheffield A	223–224	4 9 3	..
209,984	,,	,,	10	Do. B	222–224	4 9 3	..
523,500	,,	,,	10	Do. C	220–222	4 10 1	..
90,000	10	May 28	9	South African . . .	10½–11½	7 16 6	..
6,429,895	Stk.	Feb. 12	5/9/4	South Met., 4 p.c. Ord.	111–113	4 16 8	91–93
1,295,445	,,	July 10	3	Do. 3 p.c. Deb.	72½–74½	4 0 6	
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	157–159	5 6 11	..
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114–116	5 3 4	..
60,000	,,	,,	5	Do. 5 p.c. Pref. .	110–112	4 9 3	..
—	—	—	—	Do. West Kent. . .	..	—	..
137,058	,,	June 26	5	Do. 5 p.c. Deb. Stk.	116–118	4 4 9	..
629,740	Stk.	May 14	5	Southampton Ord. . .	99–102	4 18 0	..
120,000	Stk.	Feb. 12	7½†		135–138	5 8 8	..
742,275	,,	,,	6†	Tottenham { A 5 p.c. .	115–117	5 2 7	..
181,255	,,	June 26	4	District { B 3½ p.c. . { 4 p.c. Deb.	87–89	4 9 11	..
182,380	10	Dec. 30	5	Tuscan, Ltd. . . .	5–6	8 6 8	..
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93–95	5 5 8	..
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½–109½	4 11 4	..
				Wandsworth, Wimbledon, and Epsom—			
30,000	Stk.	Feb. 26	8⅜	Wandsworth A 5 p.c.	151–156	5 7 4	..
255,696	,,	,,	6⅞	,, B 3½ p.c.	129–134	5 2 7	..
108,075	,,	,,	5/17/8	,, C 3½ p.c.	110–115	5 2 0	..
352,000	,,	,,	6⅛	Wimbledon 5 p.c. .	117–122	5 0 5	..
98,000	,,	,,	6⅜	Epsom 5 p.c. . . .	121–126	5 5 2	..
88,416	,,	June 26	3	3 p.c. Deb. Stk. . .	66–69	4 6 11	..

x Bargains marked thus were "Ex Div."

The Directors of the Bombay Gas Company, Limited, have announced a dividend at the rate of 4½ per cent. for the six months ended Dec. 31; making with the interim dividend 7½ per cent. for 1914—the same as for the preceding year.

The Dublin City Electricity Committee have modified their original proposal for an increase of 1d. per unit for lighting and ½d. for power to ½d. for lighting and ¼d. for power; it having been ascertained that the contractors are prepared to supply 60 per cent. of the coal required until June at the regular contract price of 14s. 5d. per ton.

The tenders for "D" (5 per cent. maximum dividend) stock of the Croydon Gas Company—as recently advertised in the "JOURNAL"—were opened last Tuesday at the Company's office, and ranged from £100 to £110 per cent. The £25,000 offered has been allotted at an average price of £100 8s. 7d. per £100.

In the course of a letter just to hand from the Lindsay Light Company, of Chicago, it is pointed out that they are now manufacturing thorium nitrate and cerium nitrate from monazite sand obtained by them in India. They have already been successful in securing some orders for shipment of the chemicals to England.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

LADY INTERVIEWER AND DEMONSTRATOR. Tynemouth Gas Company.
ENGINEER AND MANAGER. Southend Gas Company. Applications by April 17.
WORKS CHEMIST (TEMPORARY). No. 6012.
DRAUGHTSMAN. No. 6014.
WORKS FOREMAN. Beccles Gas Company.
WORKS FITTER. Leek Gas Department.

Gas Works for Disposal. No. 6011.

Plant, &c. (Second-Hand), for Sale.

WASHER, ENGINES, AND EXHAUSTER. Blyth Gas-Works.
SCRUBBER. John Adams and Sons, Newcastle-on-Tyne.

Plant, &c. (Second-Hand), Wanted.

VALVES. No. 6009.

Sales of Shares.

GRAYS AND TILBURY GAS COMPANY. London Mart. April 13.

Sales of Shares (*continued*).

ST. ALBANS WATER COMPANY. London Mart. April 13.

TENDERS FOR

Carbon.

BRISTOL GAS COMPANY. Tenders by April 8.

Sulphuric Acid.

BURY CORPORATION. Tenders by April 17.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

EASTER HOLIDAYS.

It is proposed to issue the "JOURNAL" a day later next week—on Wednesday rather than Tuesday.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

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Payable in advance. If credit is taken, the charge is 25s. a year.
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All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

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Resists 4500° Fahr. Best for GAS-WORKS.
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SIMULTANEOUS DISCHARGING-CHARGER.
The One Machine which Discharges and Charges at One Stroke.
See Advertisement, March 23, p. 765.
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THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, Feb. 16, p. 364.

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E. C. LORD, Ship Canal Tar-Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.